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PRACTICAL
WINERY & VINEYARD
20TH ANNIVERSARY
JANUARY/FEBRUARY 2000

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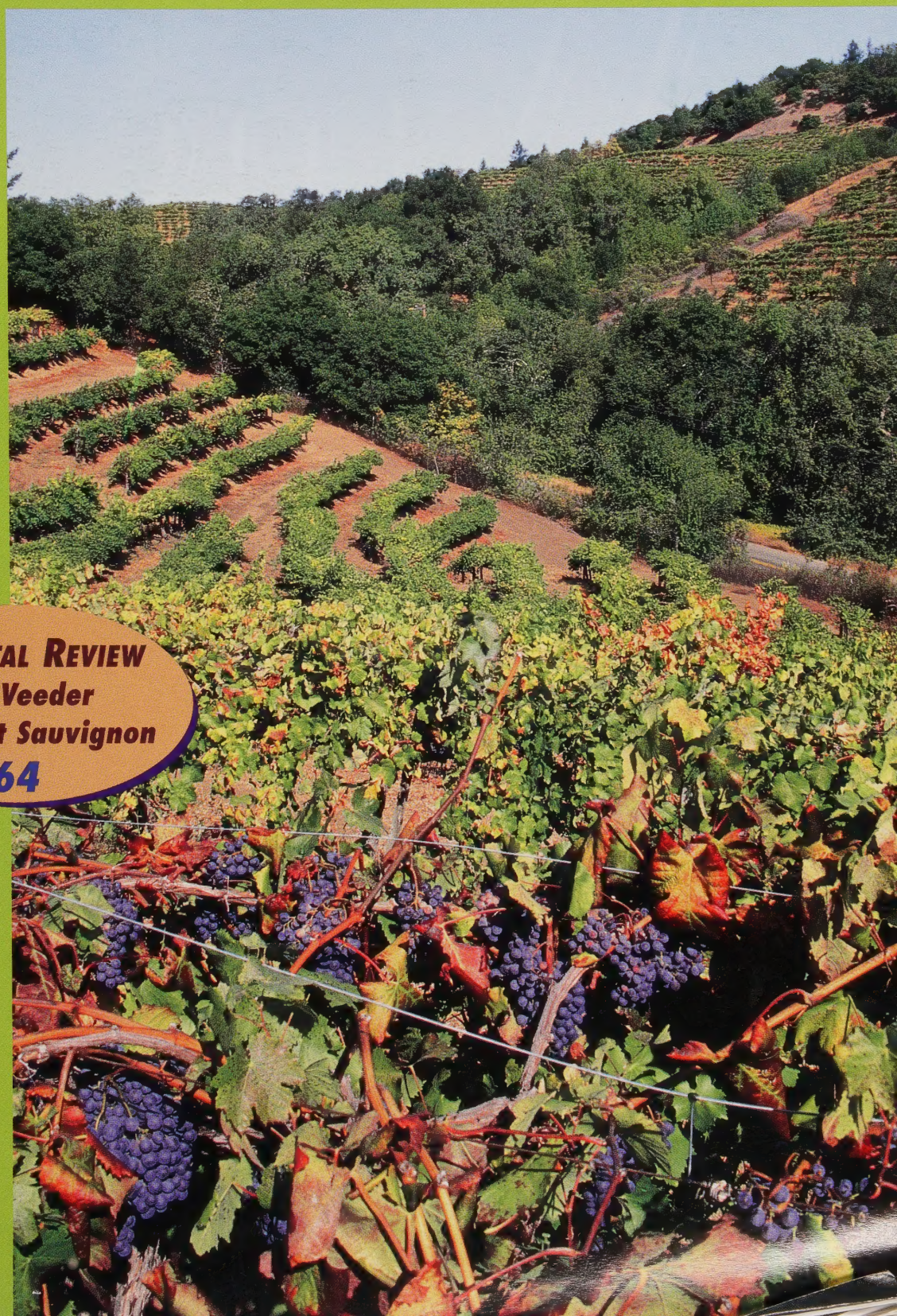

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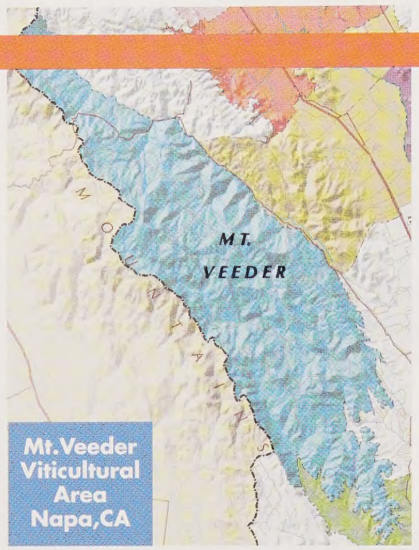

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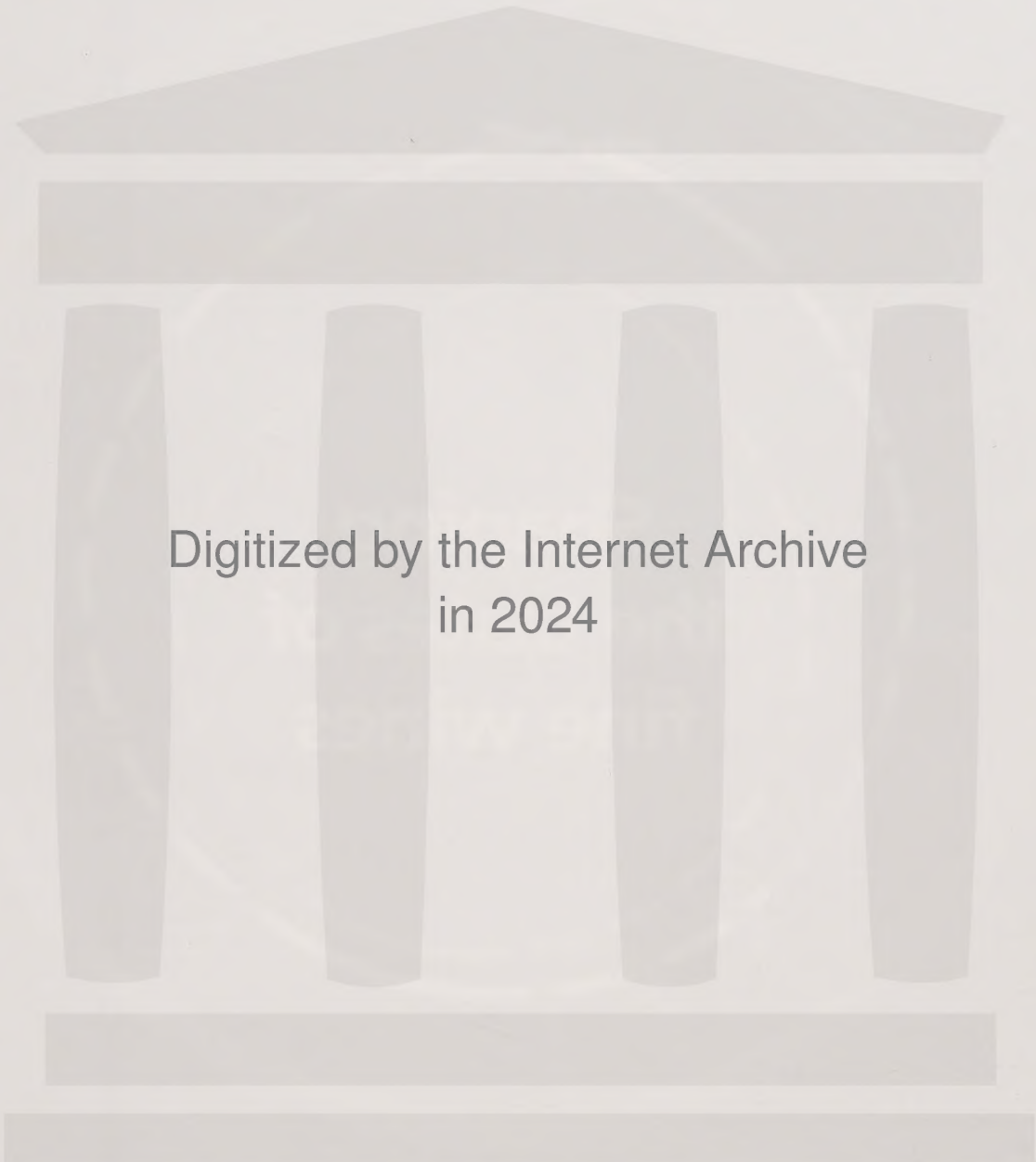
By: Fred Lyon

"To stimulate continuing improvement in the wine industry."



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CALIFORNIA ASSOCIATION OF WINEGRAPE GROWERS

WINE LABEL SURVEY RESULTS

IN June, 1998, the California Association of Winegrape Growers (CAWG) retained Dennis H. Tootelian, PhD, to conduct an independent study of consumer understanding of and attitudes toward specific information placed on wine labels. Three broad categories of issues were the focus of the study:

- Labeling of formula wines (*i.e.*, wines that are a blend of grape wine, fruit juice, sugar, water, and natural and artificial flavors).
- Labeling of imported bulk and bottled wines.
- Appellations of origin on wine labels, on other parts of the bottle or container, and on advertising and promotional materials.

Dr. Tootelian is a Professor of Marketing and Director of the Center for Small Business at California State University, Sacramento. He has extensive experience in both agricultural and general business survey research, the results of which have appeared in such publications as *The Wall Street Journal*, *Forbes*, *The Congressional Record*, and *The Kiplinger Report*.

Some of the specific questions under study were:

- Do consumers believe most wine labels accurately reflect what is in the container and to what extent do they feel this information is important to their purchasing decisions?
- What are consumer expectations with regard to such label statements as "California Cabernet Sauvignon with natural flavors" and "California Chardonnay with natural flavors"? Do they expect these products to be varietal wines, such as Cabernet Sauvignon or Chardonnay, in that by law they should contain at least 75% Cabernet or Chardonnay grapes? Do they expect the products to be wines containing at least 50% grape wine as opposed to other fruit juices, sugar, water, and other ingredients?
- Do consumers assume that wine grapes come from the same geographic area where the winery is located?
- How important to consumer buying decisions is knowledge of the country where the grapes are grown?
- Do consumers believe where grapes are grown should be prominently displayed on the label, and if so, where should such statements be placed to be best noticed?
- Are consumers aware that there are beverages on the market that contain wine and other ingredients, such as sugar and other fruit flavorings?

Methodology

The methodology for this study conformed to generally accepted research practices. While any study contains a potential error factor, there is no reason to believe the methodology for this study would adversely affect the quality of the results.

Population for the survey

The population for this nationwide study was defined to be residents of the U.S. who purchase and/or consume wine products.

Research design

Given the nature of the study with respect to the issues being addressed and its nationwide scope, a telephone survey was considered an appropriate method of data collection. This allowed for the broadest reach for survey participation to ensure that most members of the population were not excluded.

While visual display was not considered a critical factor in this study, consideration was given to using intercepts for data collection. Accordingly, a pilot survey was conducted to test for possible differences in results using telephone and intercept approaches. Samples of 40 interviews using each method (i.e., telephone, intercept) were undertaken and the findings compared. Because all relevant findings were similar at the 0.05 level, it was concluded that the results would be the same with either data collection approach. Given the benefits of the broader reach of the telephone survey, this method was selected for the study.

Sample plan and sample size

A three-tiered, randomized-area, cluster-sampling plan was used to select potential participants. Because chance was the determining element in each tier, and actual respondents were selected randomly, this created a probability sampling plan.

Initially, the U.S. was divided into the nine regions conforming to those defined by the Bureau of the Census (tier one). Within each region, two states were randomly selected for inclusion in the survey (tier two), and then at least one city within each state was randomly selected for sampling (tier three). Finally, telephone numbers from each city were randomly selected for calling.

ATF proposed a new wine-flavored products category December 28, 1999, in Notice 890. Visit www.atf.treas.gov/core/regulations/rules.htm for details of the proposal and how to respond. Industry response is needed before March 29, 2000.

Sample size is a function of the confidence level, potential variations in responses, and the allowable error. This study used a confidence level of 95%, which is normal for most survey research. Potential variation in responses was computed using the results from a pilot test. Based on this analysis, the largest number of responses needed to achieve the 95% confidence level and a low allowable error was 327.

To ensure the adequacy of the sample, however, and given the nationwide sampling plan, it was decided to collect data from 800 respondents. This was

Awareness and perceptions of wine beverages

The vast majority of respondents (89%) were not aware that beverages are on the market that contain wine and other ingredients, such as sugar and other fruit flavorings. Only 11% knew these products existed.

Furthermore, the great majority (70.4%) thought it would be misleading to call such products "wine." While most respondents (59.8%) believed the term "wine beverage" gave the product a worse image, 35.2% thought it made no difference or they had no opinion.

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Significant cross tabulations

To identify possible differences in responses based on selected factors, a series of cross-tabulations and chi-square tests were completed. Chi-square tests are used to identify possible differences in actual survey responses compared to what would occur by chance given the total distributions in responses.

Only those significant at the 0.05 level are discussed here. The results should be used with caution, however, because some categories held fewer than the recommended minimum of five per cell. Still, it is believed these findings are pertinent to the study and should be presented.

Based on the chi-square tests:

- More respondents than normally expected by chance who make three to four wine purchases per month believed that wine with such statements as "Cabernet Sauvignon with natural flavors" contained at least 50% grape wine. The same was true for those who make more than six wine purchases per month.
- More respondents than normally expected by chance who purchase wine once or twice per month said the statement "with natural flavors" would have no impact on the attractiveness of the wine. Those who make three to four purchases per month or six or more per month thought it would make the wine less attractive.
- More respondents than normally expected by chance who make three or more wine purchases per month thought the name "California" created a better image for a wine than if the state's name was not on the product.
- More respondents than normally expected by chance who make three to four or more than six wine purchases per month indicated they were aware of beverages on the market that contain wine and other ingredients. Fewer respondents who purchase wine less than once or twice per month were aware of this.
- More respondents than normally expected by chance who make three to four wine purchases per month believe it is misleading to call wine beverages "wine." More respondents who pur-

chase wine one or twice per month did not feel it was misleading.

• More respondents than normally expected by chance who purchase wine priced under $6 felt there was no difference between wine with the "with natural flavors" statement and those without it. Those purchasing wine that cost $6 to $20 felt wine without the statement was of higher quality.

• More respondents than normally expected by chance who purchase wine priced under $6 thought the term "with natural flavors" had no impact on the attractiveness of a wine. However, those purchasing wine that cost $6 to $20 felt wine with that statement would be less attractive.

• More respondents than normally expected by chance who purchase wine priced more than $6 felt that the name "California" enhanced the image of the wine. Those purchasing wine that cost less than $6 indicated that it would not give the wine a better image.

• More respondents than normally expected by chance who purchase wine priced under $6 would not feel it was misleading to call wine beverages "wine." However, those purchasing wine costing $6 or more indicated that it was misleading.

• More respondents than normally expected by chance who were 36 years of age or older believed the information on wine labels was "very important" in their purchasing decisions.

• More female respondents than normally expected by chance felt that wine with the term "with natural flavors" was of a higher quality than wine without the statement.

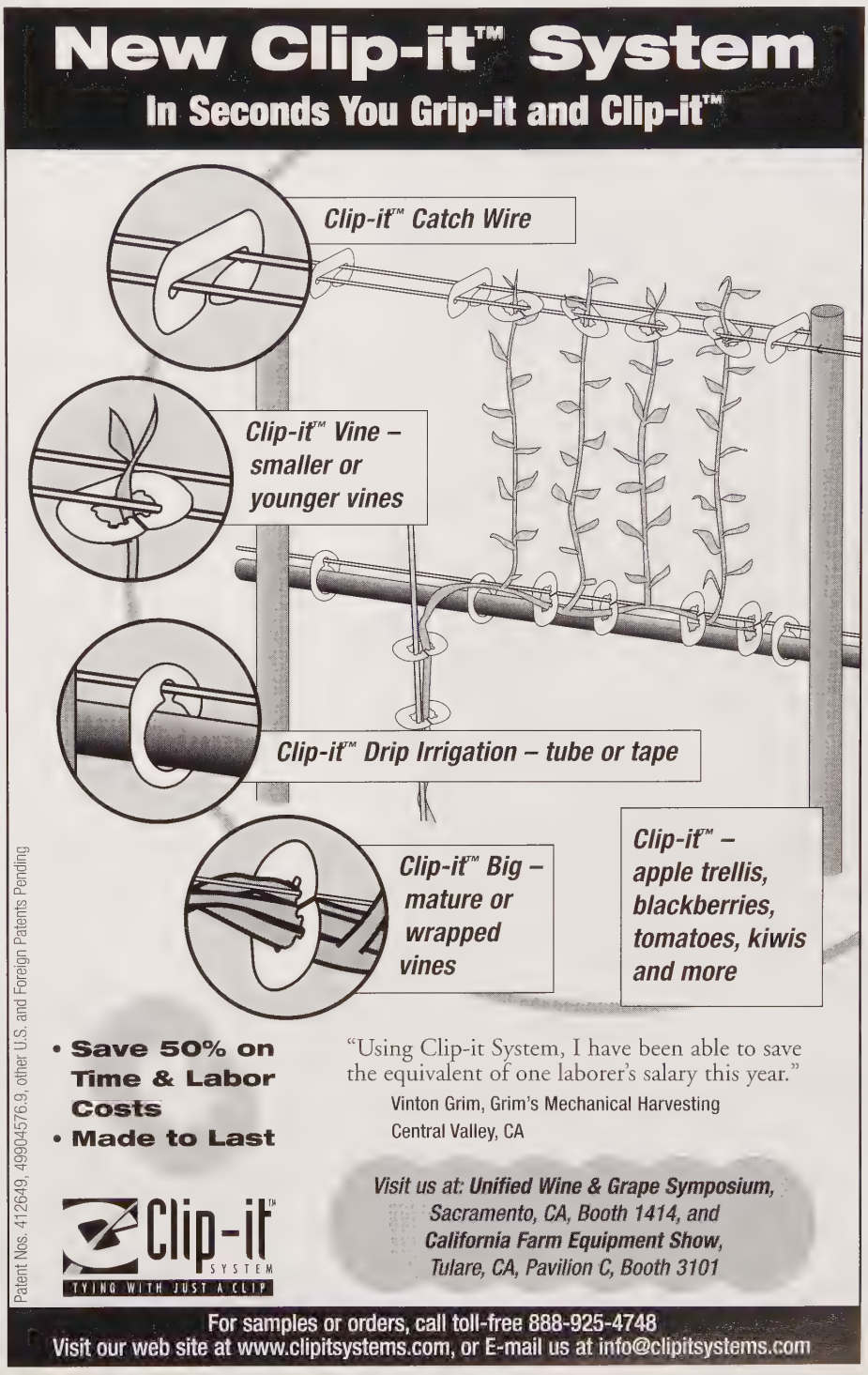
• More male respondents than normally expected by chance were aware of the fact that beverages are on the market that contain wine and other ingredients.

• More respondents than normally expected by chance who live in the Pacific and West South Central regions were aware that beverages are on the market that contain wine and other ingredients.

Overall, these chi-square findings suggest that consumers who purchase less wine and those who buy lower-priced wine are more likely to be receptive to label statements of "with natural flavors." More of this group than expected by chance said this statement had no impact on the wine's attractiveness, or fewer than expected indicated it makes it less attractive.

These consumers are less likely to be aware of and troubled by beverages on the market containing wine and other ingredients being called "wine."

More frequent wine purchasers and those who buy wines costing more than $6 per container were more likely than expected by chance to believe the "California" name provides the product with a better image. They also believe the term "with natural flavors" makes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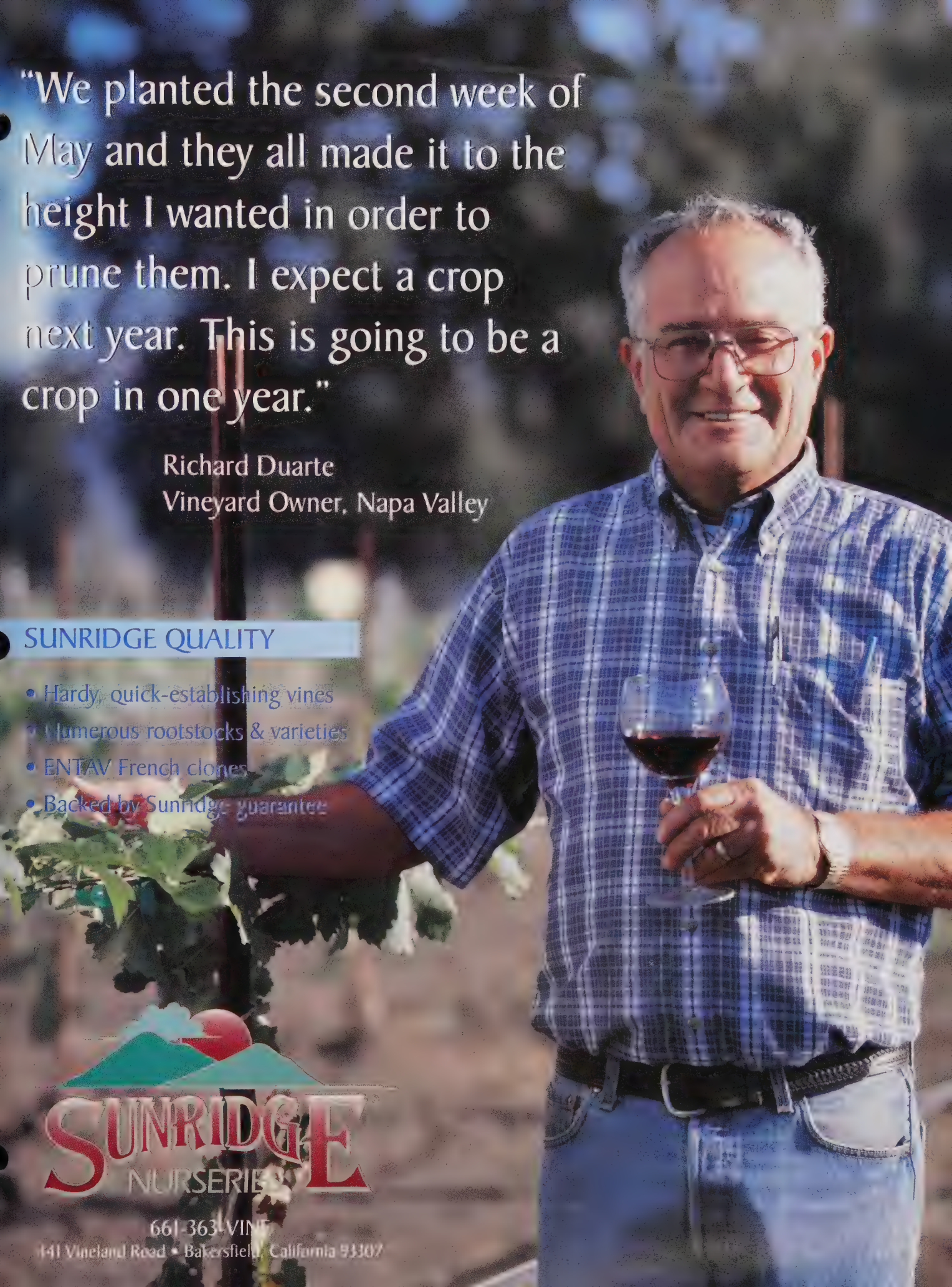
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Clos du Bois Winery EXPANDS FACILITIES

BY Don Neel

A three-year expansion program, 1998-2000, at Clos du Bois Winery in Geyserville, CA, will significantly increase the winery's capacity. More than $11 million has been spent on new equipment (tanks, refrigeration, and grape receiving equipment) and construction, which doubled production space to 240,000 sq.ft. in 1999. This will allow the winery to double tank capacity and increase barrel storage.

New construction includes a 2,400 sq.ft. shop building, one barrel room (38,000 sq. ft.), a red wine fermentor room (36,000 sq. ft.), a 16,000 sq.ft. white wine barrel room for primary and malolactic fermentation, and a bottling and dry goods room (30,000 sq. ft.) with a second loading dock, which will hold four truckloads of glass bottles. This addition required extensive alterations to the site, including a new crush pad, new utilities, roadways, parking areas, and landscaping.

In the new red fermentor room (stainless steel cellar), there are eight 14,400gal, seven 34,400gal, seven 30,000gal, eight 6,600gal, six 13,800gal, thirteen 6,700gal, one 3,000gal, one 4,200gal, and one 5,600gal red fermentation tanks built by Santa Rosa Stainless Steel and WESTEC, Healdsburg, CA. This room has 806,000gal capacity installed and room for about 600,000 gallons more in tanks in the future. Approximately 450,000 gallons will be added in 2000.

The existing crush pad had four tank presses fed by a belt-conveyor system built by WESTEC to deliver whole-cluster white grapes to the presses and a separate system to deliver fermented red grapes.

New crush pad

The new crush pad, erected by WESTEC in 1999, contains one new Delta 8 destemmer and two new Bucher RPA 320 (60-ton capacity) tank presses. An improved conveyor system unloads a press load of white grapes in 10 to 12 minutes. It takes 25 minutes on the old crush pad. This allows the handling of one more press load per day. The new crush pad's diversion conveyor feed can deliver fermented red grapes to a press without maceration of the fermented material.

Above: Architects gave Clos du Bois' new additions the feel of a 21st-century farmstead.

Left: New crush pad in foreground, existing crush pad in background. (Photos by George Rose)

Mike Reynolds (Clos du Bois maintenance) created a simplified control system by programming the PLCs to operate the new conveyors in conjunction with the two new presses.

Bottling equipment

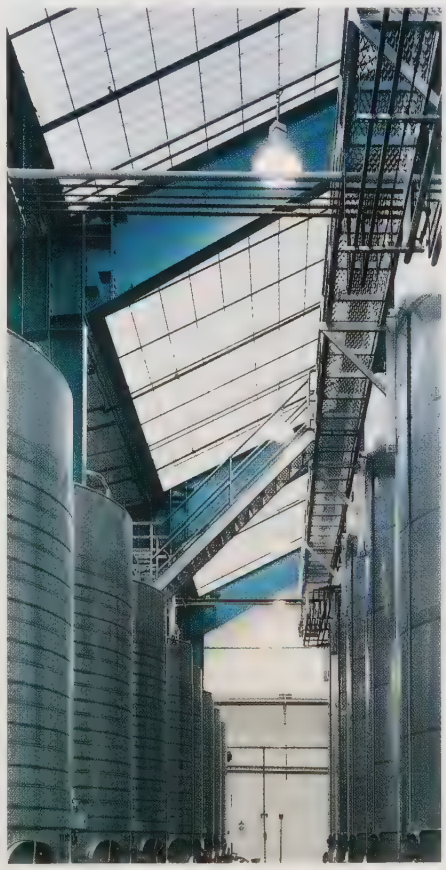
The existing bottling line will continue to handle 375ml, 1.5L, slope shoulder 750ml, odd-shaped 750ml bottles, and short runs. In early 2000, a new 350-bottle per minute bottling line for 750ml bottles will be installed at a cost of more than $3 million.

Equipment in the new bottling line includes: an ABC uncaser, single filer; a KRONES monoblock with a bottle cleaner, 63-valve, long-tube, vacuum gravity-assist filler, and 18-head corker; one Palace pneumatic cork conveyor; one FILTEC inspection station; two parallel monoblocks containing a Robino Galandrino capsule dispenser and Bertolaso capsule spinner; one KRONES rotary wet-glue labeler; two three-lane dividers; two Hartness International case packers; one ABC case-sealer; one Currie palletizer; and one MIMA shrink-wrap machine.

Building construction

This project uses a hybrid scheme of insulated tilt-up concrete panels for exterior walls and long-span steel "bents" for the roof structure. The original building was designed with glu-laminated/tube steel trusses and a panelized wood roof system. The addition was priced by Soule Building Systems in steel at a considerable savings. Soule provided the metal roof, sheet metal flashings, gutters, downspouts, and roof insulation. One barrel cellar was enlarged by 18,000 sq. ft. by moving the westerly tilt-up walls 90 feet further west to a new foundation and enclosing the space in a manner similar to the original barrel cellar.

The insulated walls provide a low maintenance interior and exterior finish that can stand up to the harsh environment of a winery while providing good insulation and thermal mass, important in maintaining stable interior temperatures. The concrete walls also provide some lateral bracing for earthquake loads. The metal building system supplies long span roof mem-



Top: Black grapes are dumped into the receiving hopper and conveyed to destemmer. (Photo by Lenny Siegel)

Left: Running the 200-ft length of the new stainless steel cellar is a 15-foot wide insulated skylight manufactured by Kalwall. Diffuse natural light generated by the north-facing skylight gives the tank room a light, airy feeling and supplements artificial lighting.

Bottom: Pressed grapes fall out of the press onto an incline troughing conveyor for delivery to the pomace removal truck.

A vine is a vine is a vine. Until you write the check.

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All the clones	✔	✔	✔
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Free trimming		✔	✔
Free cold storage		✔	✔
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Free shipping in US			✔
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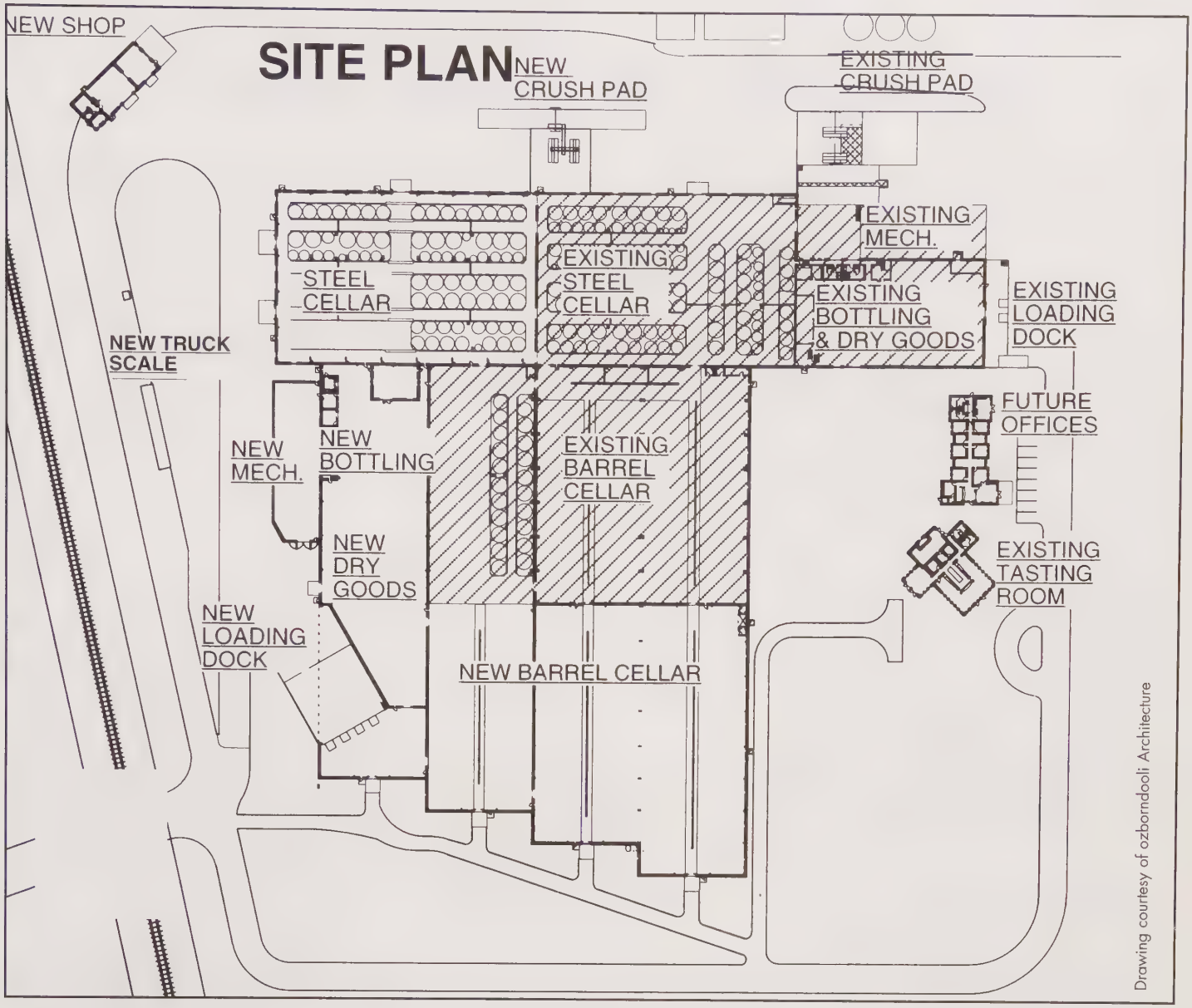


bers, minimizing the number of interior columns, reducing construction costs, and accelerating construction.

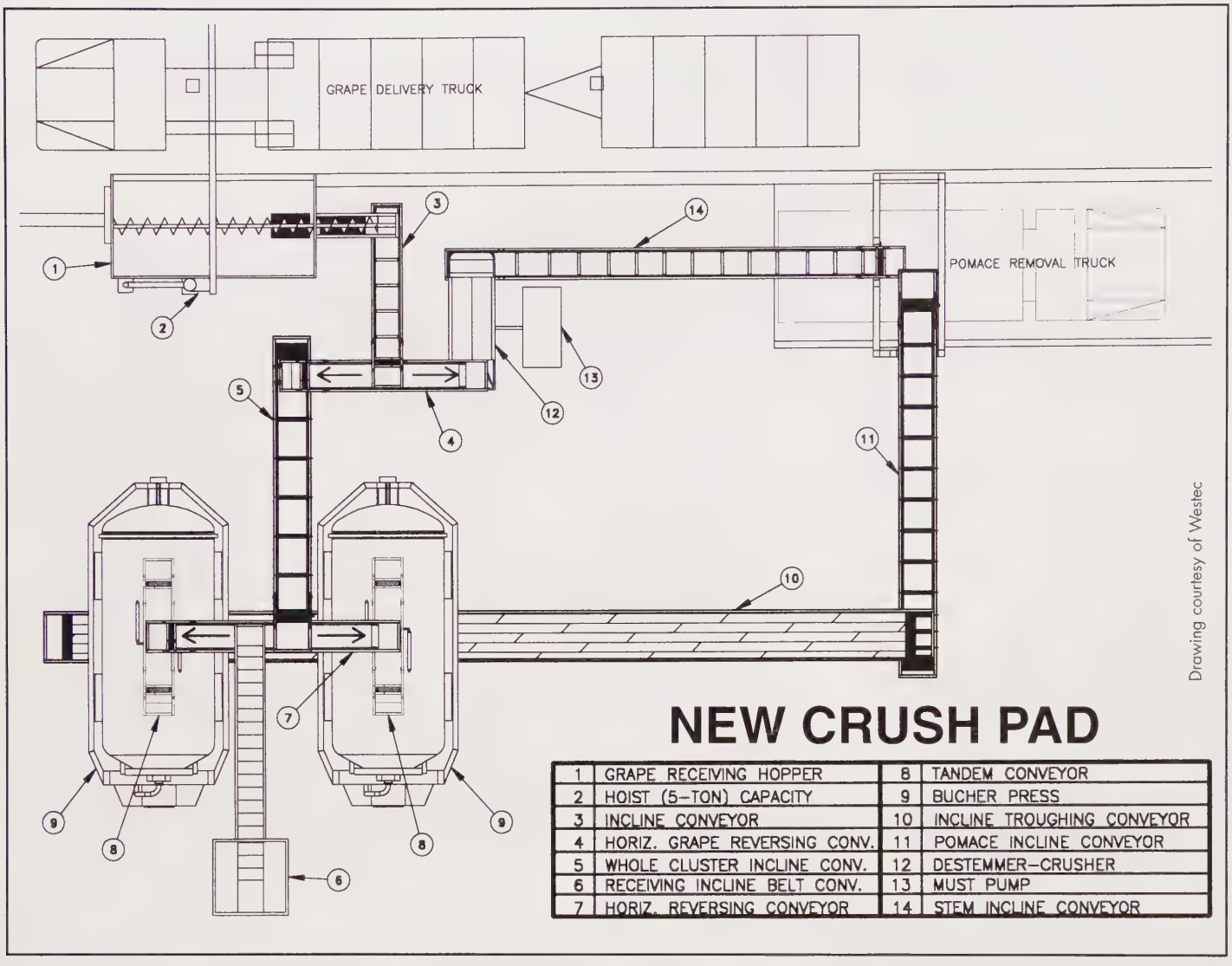
To screen the loading dock from the view of visitors, ozborndooli Architecture (Santa Rosa, CA) angled the loading dock away from the entry road. A column-free area at the loading dock was created by using a 135-ft clear span steel struss designed to support both the roof members and the lateral thrust from the frames supplied by the metal building manufacturer.

The completed building has the feeling of a 21st century farmstead. "Our new building gives us a tremendous advantage," says Margaret Davenport, winemaker. "We have been able to establish distinct and separate winemaking regimes for each wine. In effect, Clos du Bois operates as several small wineries, all under one big roof."

Refrigeration improvements

A new 400-ton capacity natural gas-driven, ammonia chilling system built by Industrial Refrigeration and Process Piping (IRAPP) (Healdsburg, CA) was installed to cool all stainless steel tanks in the white cellar and new red fermentation cellar. Although the new system has a high initial installation cost (approximately 30% to 40% higher than other systems), the detailed payback analysis shows that the system will pay for itself after 2.8 years and provide operating-cost savings in all subsequent years.

By using natural gas-driven TECO-FROST units, the winery will save in natural gas and electrical costs, and the infrastructure needs are minimized, greatly reducing the peak demand charge. The FES/ TECO-FROST units generate up to 1.75 million BTUH of hot water (up to 180°F) and can be powered by a small generator should a power outage occur.



NEW CRUSH PAD

1	GRAPE RECEIVING HOPPER	8	TANDEM CONVEYOR
2	HOIST (5–TON) CAPACITY	9	BUCHER PRESS
3	INCLINE CONVEYOR	10	INCLINE TROUGHING CONVEYOR
4	HORIZ. GRAPE REVERSING CONV.	11	POMACE INCLINE CONVEYOR
5	WHOLE CLUSTER INCLINE CONV.	12	DESTEMMER–CRUSHER
6	RECEIVING INCLINE BELT CONV.	13	MUST PUMP
7	HORIZ. REVERSING CONVEYOR	14	STEM INCLINE CONVEYOR

Ironically, in late September during harvest, the primary PG&E transformer went down, and the winery was without power for about 16 hours. A generator was quickly obtained, and the gas-driven equipment was back online soon thereafter.

Natural gas-driven systems do have higher maintenance costs; however, these costs were included in the payback analysis. The three TECOFROST units are controlled by individual microprocessors with a phone modem, are accessible remotely, and are monitored by IRAPP, Clos du Bois, and Tecogen. Tecogen, a division of Thermo Power Corp. (Waltham, MA) provides maintenance from Fairfax, CA, and daily monitoring by modem.

The new ammonia system consists of three 150-hp TECOFROST natural gas-driven screw compressors; a FES semi-welded flooded, glycol chiller; an Evapco, Inc., evaporative condenser; four Bell & Gossett glycol pumps (three primary and one light-load pump); and a 1.8-million BTUH, double-wall, hot water heat-reclaim system. The heat reclaim system is connected to two storage tanks (6,500-gallon capacity each) and can be maintained at 160°F to 180°F. The refrigeration system is controlled by an Alan Bradley PLC, while control of all tanks and room cooling is provided by Moon Valley Circuits.

The winery's former ammonia chilling system has been modified to cool its new and existing barrel rooms. This system generates ice at night to chill glycol to 32°F. The glycol now circulates through air handlers and maintains the barrel rooms at 55°F and 75% relative humidity.

1999 harvest performance

Chuck Stewart, facilities manager, reports the new crush pad and equipment were up and running for the 1999 harvest, and they performed well. "The new crush pad was designed to take advantage of electrical controls and the efficiencies of belt conveyors to create a smooth, quick operation. It allows grape trucks and the grapes to pass through as quickly as possible without compromising quality." ■

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Waukesha Universal 130

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LODI-WOODBRIDGE WINEGRAPE COMMISSION

Robert Young honored with Integrity Award

BY Millie Howie

On October 27, 1999, nearly 300 friends gathered in Lodi, CA, to toast Robert Young as he received the second annual "Wine Industry Integrity Award," presented by the Lodi-Woodbridge Winegrape Commission (Lodi, CA). Young has been a rancher in Sonoma County's Alexander Valley (Geyserville, CA) for more than 60 years and is a pioneer winegrape grower, who first planted Cabernet Sauvignon there in 1963.

The Integrity Award selection panel, chaired by wine journalist Gerald D. Boyd, included Dr. Richard Peterson, Folie a Deux Winery (St. Helena, CA); Karen Ross, California Association of Winegrape Growers; Allen Shoup, Stimson Lane Vineyards & Estates (Woodinville, WA); Simon Siegl, American Vintners Association; Bob Thompson, wine journalist; Debbi Zachareas, wine buyer Bacar Restaurant (San Francisco); and 1998's award recipient, Patrick Campbell, Laurel Glen Vineyards (Glen Ellen, CA).

"In our discussion about integrity, Bob Young was an obvious choice, both as a pioneer and a mentor in the winegrape industry," stated Boyd. "The committee agreed that his integrity, on a personal and professional level, serves as the highest example of those qualities we associate with the meaning of the word."

Industry friends speak about integrity

When presenting the award, Boyd defined integrity: "Integrity is the dedication to do what is right and to stand for principles in the face of opposing economic and social pressure." Boyd saluted Young as one who, for decades, has been "quietly making solid contributions in the fields of grapegrowing and winemaking."

Patrick Campbell added his comments, telling of Young's kindness to him when he was establishing his vineyard. "I've often thought, in the ensuing years," he said, "of Bob's courtesy to me. I'll bet I'm not the only young fellow Bob took time to give a helping hand to. Often it's the small moments we remember most and that tell the most about a person's character. Bob, congratulations on the award. You are a man of integrity."

Allan Hemphill, president, Associated Vintage Group, Inc. (Graton, CA), praised Bob's vision and common sense. "His ability to recognize the potential of the Alexander Valley to become a prime winegrape-growing area was visionary," said Hemphill. His common sense, Hemphill remarked, was exhibited in the value he placed on partnership with all those with whom he worked. "Bob Young," he concluded, "is one of the best examples we could choose to guide our industry."

Robert Young's son, Jim, brought the crowd to its feet with his personal portrait of his father as a man who "never sat down and decided what to be. He is just who he is. His generosity, his sharing nature, his determination, particularly, and love of life, are genuine and are every bit a piece of him. In my mind, what is really telling about dad is how he never thinks of himself. He sees the big picture and thinks 'How can we make it better for everyone?' "

Further tributes

Richard Arrowood, winemaker and president, Arrowood Vineyards & Winery, Inc.(Glen Ellen, CA), in a video-taped appearance, described the common thread that ran through

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ROBERT YOUNG VINEYARDS

Four generations in Alexander Valley

In the nearly 115 years since Robert Young's grandfather established the family ranch in Alexander Valley (Geyserville, Sonoma County, CA), succeeding generations have built an enviable reputation for producing consistently superior fruit. In early days, that fruit was fat ears of corn or wheat or shapely French prunes. But for more than 35 years, it has been premium winegrapes. Those grapes have been the foundation for a wealth of wine from such important names as Simi, Pedroncelli, Sebastiani, Windsor, Chateau St. Jean, and Arrowood. They have garnered ribbons, medals, and assorted other honors in competitions around the world.

Young, now 80 years old, was born in Alexander Valley on the ranch his grandfather, Peter Young, settled in 1886. When Peter died, his son Silas — Robert Young's father — inherited the ranch, but Silas died in 1935, when Robert Young was a 16-year-old sophomore in high school.

With the country in the depths of the Depression, and prunes selling for less than a penny per pound, the family was unable to keep up mortgage payments and the bank foreclosed. Fortunately, Tom Meeker, Robert's uncle, bought the note from the bank and took over management of the holdings until Young finished school.

Thanks to good farming practices and a healthy increase in prune prices, Young was able to pay off the debt and begin a

Robert Young vineyards continued on page 23

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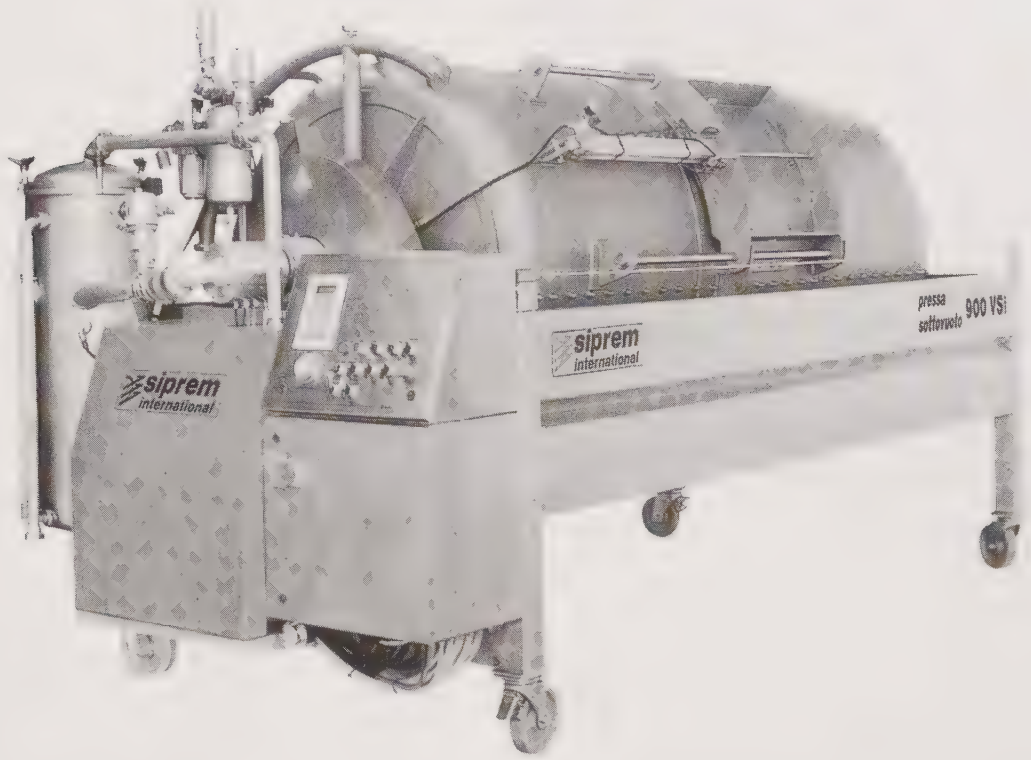

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Robert Young honored continued from 20

many accolades. "They don't teach you what integrity is in school. You have to learn it. You have to be taught by mentors like Robert Young. If you want to know what integrity is, look at Bob."

Active in wine organizations

Robert Young's service to the wine industry includes his pivotal role in formation of the California Association of Winegrape Growers (CAWG), and his two terms as president of that organization. He also maintains active membership in Winegrowers of America and a position on the University of California Advisory Committee. He has participated in meetings of the International Organization of Viticulture (OIV) in Russia, South Africa, Brussels, Spain, and Argentina. Young has also received the Santa Rosa Chamber of Commerce "Achievement in Agriculture" award.

In his hometown, Young served as an officer of the local school board and the Geyserville Chamber of Commerce, and co-chaired the committee formed to rebuild the Alexander Valley Community Hall.

Gracious acceptance

In accepting the award, Robert Young spoke briefly. "I want to thank you, one and all, for coming here to honor me. Here, in the 'Great State of Lodi,' they know how to put on a good show. You are all my friends here, and I want to say that God was with me along the way."

As Boyd handed the award to Young, the crowd responded with a spontaneous standing ovation. ■

Award of Merit recognizes former Lodi farm advisor

The Lodi-Woodbridge Winegrape Commission also recognized Jim Kissler, San Joaquin County Viticulture Farm Advisor, from 1957 to 1986, with its 1999 Award of Merit. Mark Chandler, executive director of the commission, cited Kissler's pioneering of many of the strategies fundamental to the success of the Central Valley's grapegrowing industry.

Kissler is credited with introducing mechanical harvesting to Lodi and with creating the Viticulture Roundtable, which brought growers together in the off-season to explore new methods and practices to improve grape quality.

After receiving degrees from the University of California at Davis in Agricultural Economics and Horticulture, specializing in viticulture, Kissler began his tenure as farm advisor. When someone once remarked that he had half his district involved in test plots, Kissler replied that, if he had his way, he would have the other half involved as well. ■

Robert Young vineyards continued from 20

family. In 1940, he married Gertrude Rottisberger (now deceased) and fathered four children: Jo Ann, Susan, Jim, and Fred.

Moving into grapes

In 1962, then-Sonoma County Farm Advisor, Bob Sisson told Robert Young that Alexander Valley was a prime region for growing winegrapes. The following year Young planted his first vineyard: 14 acres of Cabernet Sauvignon in the pasture-land behind the family home. The first crop sold for $400 per ton.

"The old-timers in the area all advised me against planting Cabernet Sauvignon," he recalls. "They said it wouldn't grow well in the valley, but in those days everything was head-pruned, and very few people knew anything about trellising."

Four years later, he added six more acres of Cabernet Sauvignon on the hillside. Beginning in 1967, with 3.25 acres, he started pulling out prune orchards and put in his first Chardonnay vines on the valley floor.

Within 10 years, all Young's prune land had been converted to vineyard. The two boys joined the business, and soon the family incorporated, first in 1971 as R. and G. Vineyards, and six years later, as Robert Young Vineyards. Jim Young, who graduated from the University of California at Davis with a degree in Plant Science in 1975, oversees all vineyard activity. Fred Young is operations manager and master mechanic.

Today, Young and his family have 317 acres under cultivation, planted with Chardonnay, Sauvignon Blanc, Pinot Blanc, Riesling, Viognier, Pinot Noir, Cabernet Sauvignon, Cabernet Franc, Petit Verdot, Malbec, Syrah, Sangiovese, Zinfandel, and Merlot.

"We continue to learn," says Robert Young. "Farming is a never-ending education. We are constantly fine tuning and looking for ways to improve with each crop. We are not afraid to spend some money to maintain quality, whether that means thinning a crop, leaf pulling, or hand selecting bunches in difficult vintages."

"When you're speaking of integrity," says Robert Young's son, Jim, "my dad certainly qualifies. In his dealings with the wineries, he never bargained or played one winery against another. He always wanted a fair price — top price, because he was delivering top fruit. He always knew who he wanted to have his grapes, and the first conversation would end with a handshake. The formal contracts would then be drawn up and signed, and my dad always stuck by his word!"

First vineyard designate

Winemaker Richard Arrowood recalls that he was receiving grapes at Windsor Vineyards when Robert Young brought in a load of Johannisberg Riesling. "Hold on," he said, as the crew prepared to dump the grapes into the destemmer. "I want to get those botrysized grapes to make a Late Harvest Riesling." That was the beginning of the close relationship between Young and Arrowood.

Meticulous attention to detail and knowledgeable vineyard

Continued on page 24

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Robert Young vineyards continued from page 23

practices have produced the extraordinary fruit quality that Robert Young is known for. When Arrowood joined Chateau St. Jean as winemaker, he continued buying Robert Young's grapes, and in 1976 released a 1975 Robert Young Vineyard Chardonnay, as the first ever vineyard designate wine. The designation has been on every Chardonnay vintage since, except for 1989 when heavy rains destroyed the quality, and the family and Arrowood agreed the fruit was not up to the vineyard designate standards. The vineyard designation was also used by Belvedere Winery on its Merlot and Cabernet Sauvignon labels until the late 1980s.

Innovations continue

Always willing to be innovative, Young installed stakes and wires in his original plantings to support the vines. However, even with the canes elevated, there was too much sprawl and the light on the grapes was uneven, so he changed to vertical shoot positioning. After the heavy rains of 1989, which caused extensive rot, he looked for better ways to keep the vines open and provide good airflow. By 1992, he had begun converting to the Scott Henry trellis system, which is now used extensively in the family's vineyards.

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At about the same time, Young elected to propagate a single Chardonnay clone, which he felt was ideal for the soil conditions, weather patterns, and viticultural practices of the ranch. Today that clone, preferred by many Chardonnay growers, is known as the Robert Young clone.

"Dad has always been on top of things," says Jim Young, citing his father's installation of sprinkler systems in all the vineyards, beginning in 1972, and his experimental plots for testing new rootstocks, established after a heavy infestation of phylloxera was discovered in the vineyard.

Replanting of phylloxera-devastated vines was begun in 1987 and completed in 1998. About one-third of the acreage is on 5C rootstock, and the rest is a combination of SO4, 3309, 101-14, and 4453, plus a 4-½ acre section with the new Borner rootstock, which is reputed to be resistant to the fan leaf nematode. Experimental one to three-acre plots of Sangiovese, Zinfandel, Viognier, Petit Verdot, and Malbec were added during the replanting.

As he replaced dying vines, Young changed to six-foot spacing between rows on 200 acres of flat land, and eight-foot rows on approximately 100 acres of hillside vineyard. "We did not see any noticeable increase in yield as a result of narrower spacing," reports Jim Young. "The vines were healthier and seemed to concentrate flavor, with smaller berries on smaller vines. In the 13 years of replanting, production held steady and fairly uniform as the ratio between vines being pulled, and the vines being planted seemed to even out.

"With the new rootstocks and closer spacing, we really have to rely on good drip systems," he adds. "The younger vines really drink up the water, particularly late in the summer."

Care for the land

Robert Young also initiated environmentally protective practices in all his vineyards. Nitrogen-fixing cover crops and permanent sod in heavy traffic areas were planted to improve and protect the soil and control erosion on hillside vineyards.

To reduce dependence on artificial products for fertilization and insect and disease control, Young turned to new technology, such as an electrostatic sprayer, which reduces the total amount of chemical needed to efficiently protect the vineyard, and a Patchen weed-seeker, which uses an electric eye to turn off the spray when equipment passes over bare ground.

"We no longer use pre-emergent herbicides," Jim Young comments, "and only use products that leave no harmful residue in the soil."

Still moving ahead

Though he was slightly slowed down by a stroke suffered in 1994 while on a fishing trip in Canada, Robert Young and his present wife, Donna, are both active in ranch activities and community affairs. In addition to his sons work at the vineyards, all Young's children are also involved in the winegrape growing as shareholders in Robert Young Vineyards and as members of the family limited partnership.

Continuing decades of premium grapegrowing, in 1999 Robert Young Vineyards sold to four top-quality wineries: Chateau St. Jean, Clos du Bois, Franciscan Vineyards, and Murphy-Goode. ■

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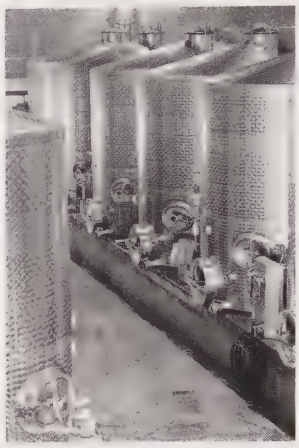

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USE OF OZONE FOR WINERY AND ENVIRONMENTAL SANITATION

BY Brian Hampson, PhD • Food Science and Nutrition Dept.
California Polytechnic State University • San Luis Obispo, CA

Since the early 1900s, ozone has been widely used for water treatment, including disinfection of municipal water supplies, swimming pools, spas, cooling towers, and sewage treatment plants. Recently, ozone has been used in food processing for sanitizing raw materials and irrigation waters, sanitizing packaging materials and storage facilities, and for sanitizing water for recycling.

Prior to 1997, ozone could only be used for sanitation and purification of bottled drinking water in the U.S., and it is widely used around the world for this purpose today. In May 1997, an expert panel assembled by the Electric Power Research Institute (EPRI) declared ozone to be Generally Recognized as Safe (GRAS) for use in food processing in the U.S.

Since then, wineries have embraced the use of ozone. Its use has been generally accepted and documented to be effective for barrel cleaning and sanitation, tank cleaning and sanitation, clean-in-place systems, and for general surface sanitation.

This same trend of acceptance has been noted in many other industries, such as fresh-cut produce processing; produce storage facilities; food processing, including meat processing facilities; and, as noted above, in the bottled water and beverage industries. In these industries, the ozone systems are generally permanently mounted or fixed in place, which makes management of off-gas and ozone monitoring for safety and efficacy relatively easy.

However, in the wine industry, ozone systems tend to be mobile, with multiple operators in multiple locations. This makes it important that safety features and ozone management systems be in place and that the system itself be reliable and easy to operate.

Understanding how ozone works

Ozone, or O_3, is generated in nature as a bluish or colorless gas characterized by the clean fresh smell in the air following a thunderstorm. When oxygen (O_2) and electricity interact, ozone is created, and this is why we smell ozone around copy machines, electric motors, or during arc welding.

Natural levels range from 0.01 ppm to 0.15 ppm and can reach higher concentrations in urban areas. Ozone is an unstable gas and readily reacts with organic substances. It sanitizes by interacting with microbial membranes and denaturating metabolic enzymes.

Ozone will also attack microbial biofilms and degrade them much as it would any other polysaccharide. Upon release of its oxidizing potential, ozone reverts back to oxygen from which it was generated. Application of ozone does not leave a chemical residual, and under ambient conditions, it has a half-life of 10 to 20 minutes. Thus, ozone must be electrically generated on-demand and cannot be stored for later use.

Ozone is generated by irradiation of an air stream with ultra-violet (UV) light at a wavelength of 185 nm or by passing dry air or oxygen through a corona discharge (CD technology) generator. For low ozone concentrations (ca. 0.14% by weight, or 0.5 grams per hour), the less expensive UV equipment is sufficient. For more demanding situations, where higher ozone concentrations (1.0% to 14% by weight) are required, CD systems are used.

The wine industry is using both CD technology and UV. Some manufacturers use multiple UV tubes to achieve a desired level of output. Several manufacturers chose to install air-cooled or water-cooled CD generators in their systems. It is really a question of how much ozone at a certain gpm is desired for an application. For CIP, 20 gpm may be desired, necessitating a larger system, while only 10 gpm at a lower concentration may provide satisfactory barrel washing.

Using ozone safely

Ozone is a toxic gas and must be monitored in the workplace when in use. However, in almost 100 years of industrial use, there has never been a human death attributed to overexposure to ozone. The Occupational Safety and Health Administration (OSHA) has set limits for ozone exposure in the workplace. These limits are for continuous eight-hour exposure of no more than 0.1 ppm, and a short-term exposure limit (STEL) of 15 minutes at 0.3 ppm, not to be exceeded more than twice per eight-hour work day.

Consequently, ozone requires monitoring in the workplace if used for environmental or equipment sanitation. Ozone monitors are readily available, and the supplier of ozone generating equipment should be able to assist with the selection and use of such monitors.

A manual containing all the relevant safety information for working with ozonating systems is essential; it should also contain operating instructions for the winery's generating system. Workplace monitoring for ozone off-gas must be performed, and records must be maintained to assure OSHA compliance.

When ozone is generated, it is important that the concentration and flow rates be verified, and these should be checked periodically by a technician on some regular schedule or interval (*e.g.*, monthly). All ozone generated should

be accounted for, by checking for leaks in the system and by proper destruction of any excess ozone.

If the ozone is being applied as a gas for the fumigation of a storeroom or cellar, monitoring at the far end of the room and feedback control is desirable. If the ozone is dissolved in water and this water is subsequently used for sanitation, there is always some excess ozone that will not be dissolved into solution.

No ozone mass transfer system is 100% efficient. Excess ozone, or entrained ozone gas, must be "degassed" or separated from the water stream prior to delivery to equipment or the processing environment. This excess ozone must also be destroyed or decomposed back to oxygen before being released back into the atmosphere. Thermo-catalytic ozone destruct units are small, efficient, and available for this purpose.

It is not enough to just purchase an ozone generator. Your winery must also have maintenance, verification of performance, monitoring, and, especially in the case of mobile ozone units, an in-place systems approach that ensures the safe use of ozone in the workplace. Properly used, these ozone sanitizing systems are much safer than chemical (chlorine and caustics) or heat-based sanitizing systems.

Oxidation of equipment and facilities

One concern is that use of ozone will oxidize equipment and facilities, and this can happen if the materials are incompatible with ozone. Most materials used in food processing are compatible. Stainless steel (*e.g.*, 316L) is corroded less by ozone than by chlorine, and common plastics used in food processing are generally resistant, including ECTFE (Halar®), PTFE (Teflon®), PVDF (Kynar®), PVC (rigid, schedule 80 or 40), and silicon tubing and gaskets. Natural rubber will readily degrade; however FPM (Viton®) and Teflon gaskets are very stable.

When ozone is used in high concentrations, stainless steel, Teflon, and Kynar are the best construction materials. PVC should be avoided under high concentration conditions. In general however, high concentrations (in the low percent range) are only found inside the generator or in the ozone-to-water contacting system. Aside from natural rubber material, brass and copper should also be avoided for concentrations over 1.0 ppm of ozone dissolved in water.

Evaluating ozone sanitation

Recently, in my laboratory at California Polytechnic State University, a study was performed to evaluate ozone's effectiveness as an environmental sanitizer. The fruit and vegetable pilot plant in the university's Food

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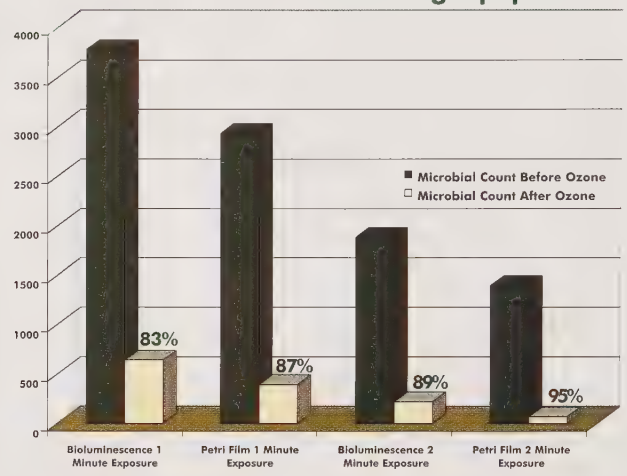

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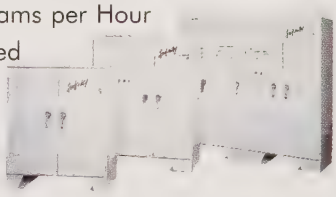

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Science and Nutrition Department became the location for the test, and the ozone system used in the study was a DEL Industries model AGW-0500 Surface Sanitizer™. This system is able to deliver an applied dose of 2.0 ppm through a 10 gpm hand-held spray wand, typically delivering a residual (measurable) dose of around 1.5 ppm ozone-in-water solution.

Environmental ozone monitoring was performed using an EcoSensor ambient monitor, and concentrations in solution were verified using a Rosemount Analytical dissolved ozone monitor (model 1054B).

Various surfaces in the facility were sprayed with the ozonated water in a back and forth fashion for one minute. The test surfaces included a polished stainless steel mixing kettle and table top, stainless steel shroud, central floor drain, a plastic shipping container, and two locations on the non-slip epoxy-coated concrete floor of the facility (area 1 is high-traffic and area 2 is low-traffic).

Test areas were not cleaned prior to sanitation, so only the effect of the ozone spray wash was measured. Testing was repeated four times, and microbial load of a 100 cm^2 area was measured before and after ozone application, using both aerobic plate count (3M APC Petrifilm) and bioluminescence (Biotrace; UniLite UXL 100 Bioluminometer). Results are presented in Table I.

Table I

Location	% Reduction (plate count)	% Reduction (biolum)
Stainless steel (kettle)	89.7 to 98.2	87.6 to 91.8
Stainless steel (table top)	98.9 to 99.7	90.0 to 93.8
Stainless steel (shroud)	63.1 to 99.9	68.8 to 92.2
Floor surface, area 1	67.0 to 95.6	75.2 to 96.1
Floor surface, area 2	84.3 to 99.9	32.8 to 48.8
Floor drain	*	54.7 to 66.5
Floor drain (2 minutes)	77.5	92.9 to 99.4
Plastic shipping container	96.9 to 97.2	68.9 to 97.4

* Due to drainage and sampling problems, results from this location were inconclusive.

The results indicate that ozone applied as a spray wash is effective in reducing microbial load in the processing environment. The drain presented problems during the test because the ozonated water applied to the drain washed throughout the long central drain ditch, which made results inconclusive. A second test on the drain for two minutes of exposure did provide a reduction in microbial load (see Table I).

One advantage ozone has is its ability to readily oxidize microbes in solution. Thus, once a surface is spray-washed, the microorganisms physically lifted from the surface will be killed as they find their way to a drain. The data above represents one series of tests over a two-week period (evaluations performed approximately every third day). With continued or daily use, it is reasonable to expect that the microbial load will be significantly eliminated at all locations exposed to the ozone.

Because ozone requires no storage or special handling or mixing considerations, it may be viewed as advantageous over other chemical sanitizers. Some may consider the fact that ozone leaves no sanitizing residual a disadvantage, but if a residual is desired, there are many other sanitizers available to accomplish that. Ozone can be considered a complimentary sanitizing regime to help maintain the overall cleanliness and sanitation of a winery. ■

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SOUTHCORP WINES

CALIFORNIA WINEGROWING *AUSTRALIAN STYLE*

BY Eleanor & Ray Heald • Contributing editors

Australian viticultural techniques are being implemented on California's Central Coast by Southcorp Wines. Headquartered in New South Wales, it is Australia's leading wine company, producing several well-known brands, including the Penfolds and Lindemans labels.

Southcorp targeted California for its first vineyard acquisition and development outside Australia because of the common language and similar climates.

Southcorp's initial entry into California grew out of a joint venture begun in 1996 with the Niven family, viticultural pioneers in California's Central Coast and owners of Paragon Vineyards, in the Edna Valley (San Luis Obispo). The partners soon launched the Seven Peaks brand, which now produces Chardonnay and Pinot Noir from Edna Valley, and Cabernet Sauvignon, Merlot, and Shiraz, sourced from growers in the Paso Robles region.

After establishing the partnership, Southcorp immediately began acquiring vineyard land and plans a winery at its newest vineyard site near Paso Robles.

Southcorp and Paragon

Paragon Vineyards operations are managed by brothers Jim and John Niven. When Jim met with Southcorp's president of North American operations Jose Fernandez in May 1996, Paragon was very successful with Chardonnay and Pinot Noir, but desired to expand its production to other red grapes, especially Shiraz, a varietal that was also of great interest to Southcorp.

The Nivens had witnessed Fernandez steadily escalate Southcorp's brands sales in the U.S. from around 90,000 cases in 1991, when he assumed the presidency, to 660,000 cases in 1996 (to two million cases in 1999). They realized Southcorp had the brand-building prowess they wanted in a winery partner.

The partnership was sealed by harvest 1996, and Southcorp immediately brought winemaker Ian Shepherd from Australia to make Seven Peaks' first Chardonnays from the Niven's Paragon Vineyards grapes. Wine for Seven Peaks 1996 through 1998 vintages was made at Maison Deutz (now Laetitia Winery).

Red grapes sourced from the Niven's Stagecoach Vineyard in the Paso Robles region, and from other growers in the Central Coast, enabled Seven Peaks to expand the brand beyond Chardonnay and Pinot Noir production.

In 1999, the Nivens built the new Baileyana Winery in Edna Valley. Southcorp rents space there to produce Seven Peaks Chardonnay and Pinot Noir, sourced from Paragon and a few other growers.

Since 1996, other Seven Peaks red wines have been made at Associated Vintage Group's Hopland Winery in Mendocino County.

Developing an Australian style in California

Southcorp's goal was to produce Australian-style wines from California grapes. To maximize winemaking options in the first year, fruit was picked from six Paragon Vineyards blocks. "I had no prior experience with California fruit," Shepherd notes. "Obviously Paragon had a pedigree and we knew it was good, but we didn't know the best blocks within the vineyard for a style we had in mind, which had to represent Australia."

Because Maison Deutz was created as a sparkling wine facility, Seven Peaks' first Chardonnay grapes were pressed in a Coquard press. Southcorp viewed this as a distinct advantage because the Coquard press produces low solids.

Montrachet, CY3079, D-47, and EC1118 yeasts were used to ferment the first 6,000 cases of reserve Edna Valley (Paragon Vineyards) and 27,000 cases of Central Coast Chardonnay, sourced from growers other than the Nivens. "The reserve wine was given Rolls Royce treatment all the way through," Shepherd remarks.

All juice was barrel-fermented. Central Coast Chardonnay remained in barrel four months on the lees. The reserve was nine months on lees. Both wines were lees-stirred every two weeks until completion of MLF (malolactic fermentation).

All barrels were inoculated with a malolactic culture that was used routinely at Maison Deutz. "I believed that introducing an ML strain that worked in Australia might not necessarily be the best plan in California," Shepherd explains.

"Typically, with cool climate fruit in Australia, we strive for a balance between non-MLF and MLF. That provides the acid that gives wine freshness and crispness, while allowing fruit to stand out."

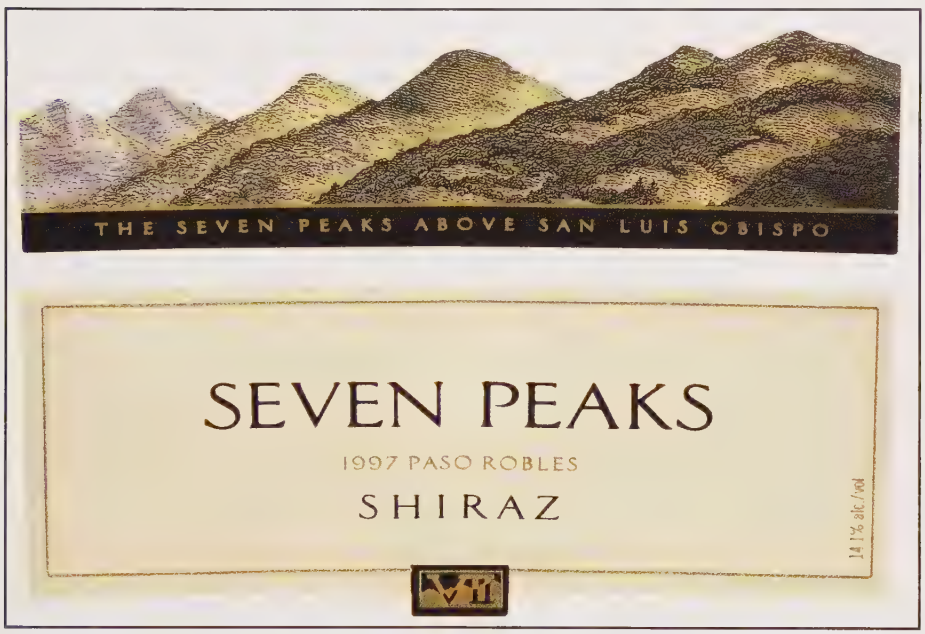
In the first year, 30% of the reserve and 40% of the Central Coast did not undergo MLF. Early guesses at the proper technique produced a marked

Australian Chardonnay style. But by 1998, Shepherd gained more confidence in not doing MLF and now just 40% of the wine undergoes MLF and 60% does not — "which is more like we do in Australia," he notes.

French oak was used exclusively, as is the custom for Australian-produced Southcorp brands. In the first year, 70% of the barrels were new and 30% were purchased as older barrels. Today, Seven Peaks Chardonnay is made in 60% new French oak. "We use some American oak for Chardonnay in Australia, but generally not for high-end wines," Shepherd adds.

partial juice oxidation is typical, and it is practiced with Seven Peaks Chardonnay. Grapes are pressed without addition of SO_2, but it is added at 40 ppm immediately in the tank so the juice does not get too brown. "Our experience in Australia indicates that if juice gets too brown, we end up with a nutty complex wine, but with fruit characters dropped out," Shepherd maintains.

In harvest 1998, Shepherd opted for more night-machine picking at Paragon. To retain green juice, he added SO_2 to 20% percent of the fruit picked into two-ton bins.



Principal fruit differences

Shepherd explains that, due to the fog influence, Edna Valley fruit is not nearly as golden in color as what he worked with in Australia. Even cool climate Australian fruit gets a little sunburned, because the sun in Australia is stronger.

Edna Valley fruit is very green and translucent in appearance. "I almost thought it was not ripe, but it tasted ripe at 23.5° to 24° Brix," he notes. "Because of my experience in Australia, it was very unusual for me to taste ripe fruit that still retained green color. I now believe retention of green color offers the tropical character dominant in Edna Valley Chardonnay."

At Southcorp's wineries in Australia,

Southcorp vineyard in Creston

Southcorp prefers to have greater control from vineyard to bottle than is possible when others own the vineyards. In California, this has been particularly important with Shiraz, Bordeaux varietals, and Zinfandel.

Aden Brock, manager of Southcorp Vineyard Operations USA, notes that it is the Penfolds philosophy for the winery to grow a lot of its own fruit. "We buy from growers, but tend to find that the fruit we grow ends up producing some of the best wines we make."

Soon after the Seven Peaks partnership began, Rob Gibson, the Penfolds group viticulturist (at that time) and Jim Efird, who manages Paragon Vineyards, began looking up and down the U.S. Pacific coast for a vineyard site for Southcorp to purchase.

In judging locations, Efird thoroughly examined U.S. Geological Survey soil maps and spent a lot of time flying over different areas. He also assessed water and labor availability.

"The Paso Robles region was one of the few prime regions where Penfolds could buy a large land tract," Brock points out. "Along the California coast, it's getting more difficult to buy a several hundred-acre parcel that is highly usable at a price per acre that makes fiscal sense."

To Southcorp, the most significant considerations in a ranch purchase were water availability, soil type, climate, labor pool, and land cost.

In 1997, Southcorp purchased a 600-acre ranch in Creston, CA, and began making improvements immediately on 400 acres. "We view this property as climatically similar to the reasonably warm Barossa Valley or Clare Valley in Australia," Brock continues. "It has the potential to produce Penfolds-style, Kalimna-like reds."

While Fernandez declines to reveal the purchase price, he does say, "Since we purchased the land, prices have doubled, and in some locations tripled, in Paso Robles."

Critical element

"Lack of water is a limiting factor to greater vineyard planting in Australia,"

(L to r) Southcorp's vice president U.S. production operations, Ian Shepherd, and manager of U.S. vineyard operations, Aden Brock, second leaf Shiraz vines, summer 1999 (photo by Ray Heald).

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Brock notes. "Water is essential to establish a young vineyard in the Paso Robles region. Compared to what I'm used to in southeast Australia, the water on the Creston property is fabulous."

Southcorp's vineyard had two existing wells at 600 feet pumping water at 400 ppm salt content, which is essentially the quality of rain water. Both pump 1,000 gallons per hour. Another well was drilled during the vineyard design phase.

A dual irrigation system was installed, which has drip for establishing vines and to enhance deficit water management once vines are established, and has an overhead frost protection system. The system was used 12 times for early spring frost events in 1999.

Water for the overhead system is stored in two reservoirs, one which Southcrop improved and a second which Southcorp engineered. The original reservoir (35 acre feet capacity) stores run-off water and water that is pumped in, while the new one (65 acre feet capacity) contains pumped-in water only. During a frost event, 319,000 gallons of water are needed to cover the 400 acres of vines all at once.

"Without frost protection," Brock noted, "we could not have gotten the vines to grow enough to produce a first crop after three years [scheduled for harvest 2000]. The system has already paid for itself in my book."

To monitor soil moisture once vines are established, Brock will employ Enviro-Scan, a capacitance probe that will provide a continual reading and log of soil moisture.

Planting and plant material

Southcorp planted 400 acres in two stages to four red varieties. The work was begun in 1998 and completed in June 1999. Acreage for each variety was essentially the same in both 200-acre stages, resulting in a total of 200 acres of Shiraz, 70 acres of Cabernet Sauvignon, 50 acres of Merlot, and 80 acres of Zinfandel.

Plant material (100% grafted vines) was sourced from several nurseries in California. Shiraz is the Estrella River clone from a J. Lohr vineyard. After tasting fruit and wines from various sources, Southcorp concluded the J. Lohr Winery Shiraz was closest to the style they were seeking.

Mill Road Vineyard

Southcorp imported vines from Australia, which have been quarantined at Missouri State University, for its next planting. Some vines from the Kalimna and Magill estates have been released from quarantine and are currently undergoing propagation and grafting at a nursery.

It is hoped that 2,000 vines will be available in 2000 to plant at the new vineyard, which is on Mill Road off Highway 46 near Paso Robles. This 131-

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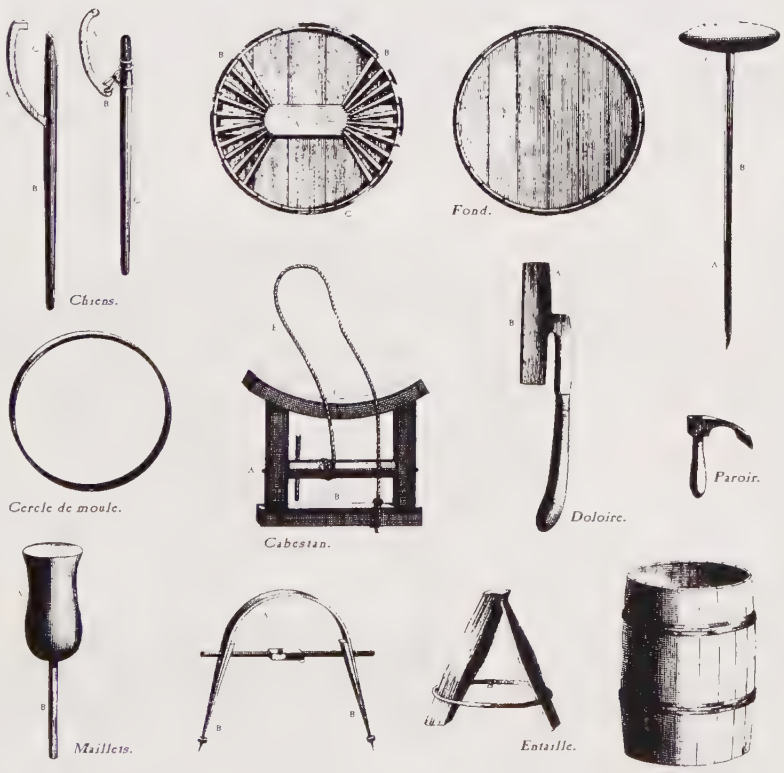

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acre vineyard (68 acres planted to Chardonnay, Cabernet Sauvignon, Merlot, and Cabernet Franc) was purchased from Jim Kolb in September 1998. As of harvest 1999, all fruit from this vineyard will go to Seven Peaks production.

There are about 15 more plantable acres on the Mill Road site. Some existing Chardonnay vines will be removed to offer more plantable acreage. In addition to Australian-origin Shiraz vines from Penfolds properties, blocks of Chateau de Beaucastel-origin Syrah from Tablas Creek Vineyard (Paso Robles) and more Estrella River clone will be planted.

"Mill Road Vineyard is well-positioned as a future Southcorp winery site," Fernandez adds. "At this time, we are not planning a winery at the more remote Creston vineyard."

Rootstocks

Southcorp's Creston vineyard was designed to match the property's soil types and water-holding capacity. The land was divided into 100m x 100m grids, and many backhoe pits were dug six feet deep across the entire property.

A soil scientist classified all the soil types, principally by texture, water-holding capacity, pH, and salinity. From this evaluation, a series of maps was constructed. Water-holding capacity was paramount, and each zone (designated low, medium, and high water-holding capacity) was assigned a different color on one map.

"We saw a trend between soil type and water-holding capacity across the whole property," Brock recalls. "From that, the vineyard was designed for rootstocks matching water-holding capacity."

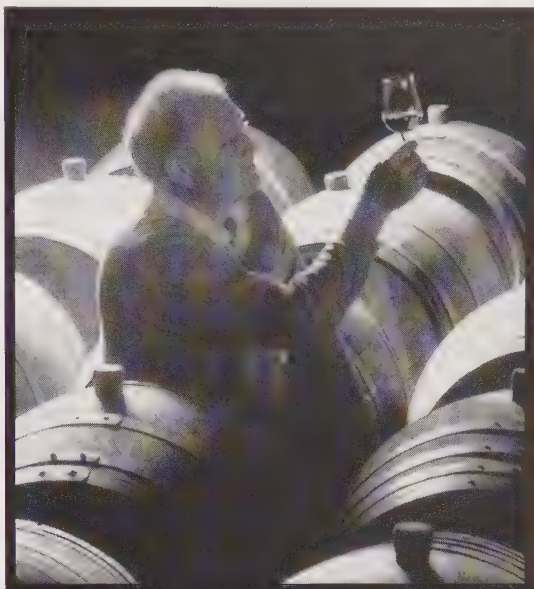
Because Shiraz is very vegetative, it was put in the worst soils — those with the lowest water-holding capacity — to devigorate vines as much as possible, thereby decreasing both bunch and berry size.

Shiraz was grafted predominantly to 140-Ruggeri (the most drought-tolerant of the rootstocks used and therefore planted in sandy soils along a creek), 1103-P (in deeper soils of sand over clay), 110-R (in the same soil conditions as 1103-P), and Schwarzman (in soils with moderate vigor and moderate drought tolerance).

Essentially the same rootstocks were used for Cabernet Sauvignon as for Shiraz for the same reasons, but Cabernet was planted in more vigorous soil types. Merlot went into the transition soils.

Isn't this contrary to traditional thought about Cabernet Sauvignon? "We put in sub-surface drains to better suit Cabernet Sauvignon to more vigorous soils," Brock responds.

"No section of this vineyard is particularly vigorous. It's either sandier soils or sand over clay, which restricts the



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root zone. That's why this land tract was attractive. It's not like Edna Valley or Salinas Valley sites, which are vigorous.

"The entire site can be classified as moderate vigor. We prefer Shiraz in the lowest vigor, then Cabernet Sauvignon in more vigorous. Cabernet Sauvignon doesn't respond to stress like Shiraz. It can have a more vigorous canopy and still produce good fruit. Whereas with a big shaded canopy, Shiraz will not yield quality fruit."

UCD Cabernet Sauvignon clones 4 and 8, suggested by Jim Efird as those with the smallest berries, were chosen. Yield projection is five tons per acre (TPA).

In clay subsoil sections, Merlot Clone 181 has been planted on 1103-P rootstock with the same projected yield. The model is Penfolds' Kalimna vineyard, which with sandy topsoil over clay, restricts the root zone.

UCD Zinfandel Clone 3 (Costamagna) and Primitivo are the Zinfandel selections.

Deficit water management

The 140-Ruggeri rootstock was chosen to allow practice of deficit water management. Once vines are up to size, irrigation will be reduced during the growing season (*e.g.* instead of watering every five days, extend to every 10 days, depending on soil type), so vines will go into a slow period of stress, but not an immediate one.

"Then we'll irrigate again and bring the vine back," Brock illustrates. "We'll follow by limiting water to stress again. Post berry set and during the rapid shoot-growth phase is the best time to begin stressing vines. The Enviro-Scan will be used to indicate soil water depletion curves and a refill point chosen, but a lot is visual, from experience.

"Depending on the growing season, we will manage irrigation and drip water right up to harvest. In the Paso Robles region, if we have hot weather during harvest, we'd be foolish to stop irrigating totally. Small amounts of water are good to freshen up the vines a little.

"It's Australian thinking, that in a premium vineyard around harvest time, vines should look quite stressed, not green and fresh. Basal leaves should have dropped."

Master plan at Creston

For economies of scale, all varieties at the Creston site have a planting density of 665 vines per acre and are spaced, trained, and trellised identically. Spacing is 6.5 feet x 10 feet to accommodate mechanization.

As is the Australian custom, all vineyard posts are wood: 225 posts per acre; 19.5 feet apart; three vines between posts, spaced to facilitate mechanical harvesting, so no vine is at the post.

Row orientation and row length choices were also made with economies

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of scale in mind. Row length was maximized without jeopardizing soil types. Row orientation is mainly north-south with some east-west rows due to slope direction. Vineyard blocks were constructed around natural barriers or soil types, while simultaneously attempting to maximize row length for mechanization.

Natural boundaries include a creek running through the property and swales, which were not planted. Roads were installed between changes in major soil types. Vineyard blocks were split to identify soil type changes.

Ten-foot aisles leave options open to establish either a vertical system or GDC-type if needed — a tight but workable design.

Vines are being trained on a bilateral cordon at 42 inches. One pair of moveable foliage wires will be lifted by a Pellenc wire lifter and stapled to either side of the post. Since Australia has a short labor force, wires are routinely machine-lifted. This will be the practice in California also.

Pruning practices will not go to the extent of what is done in Coonawarra, where machine box pruning is used. "There is a balance between machine and hand pruning that is better suited to this site," Brock explains.

"The plan is to spur-prune and preprune by machine with a Pellenc pruner, then vineyard workers will hand-thin to achieve the node count desired per vine. The goal is 15 shoots per meter, which gives 16 two-bud spurs per vine.

"In developing the vineyard, pruning is being done by hand. In the first few years, we will strive to maximize leaf growth and fill the trellis wire as quickly as possible. Once established, we'll go to machine pruning."

Brock's intent is to employ vertical shoot position (VSP) for all four red varieties. Projected yields are four to five TPA, with vines devigorated through irrigation practices.

"We should be able to accomplish this here." Brock concludes. "If VSP doesn't work, we'll go to Scott-Henry or a Smart-Dyson system. The key is to get sunlight on the fruit and drop basal leaves through proper irrigation practices, not through leaf and shoot thinning. We typically don't do much leaf removal or shoot thinning in Australia, and we don't plan to do much in Paso Robles.

"I want to be able to see through the canopy in 15% to 20% of the places I look. If this isn't occurring with VSP, then we'll need to go to another system.

"We might find that our plan is inappropriate for this site and have to leaf-pull on the morning side.

"I envision that these vines, during harvest in a couple of years, will have spurs positioned about six inches apart with two shoots per spur; bunches hanging down, well-exposed, and offering expected yields." ■

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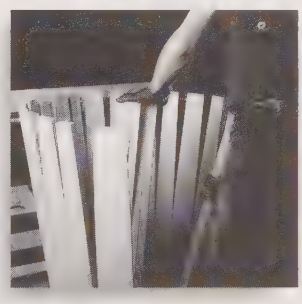

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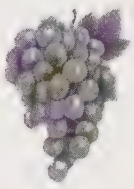

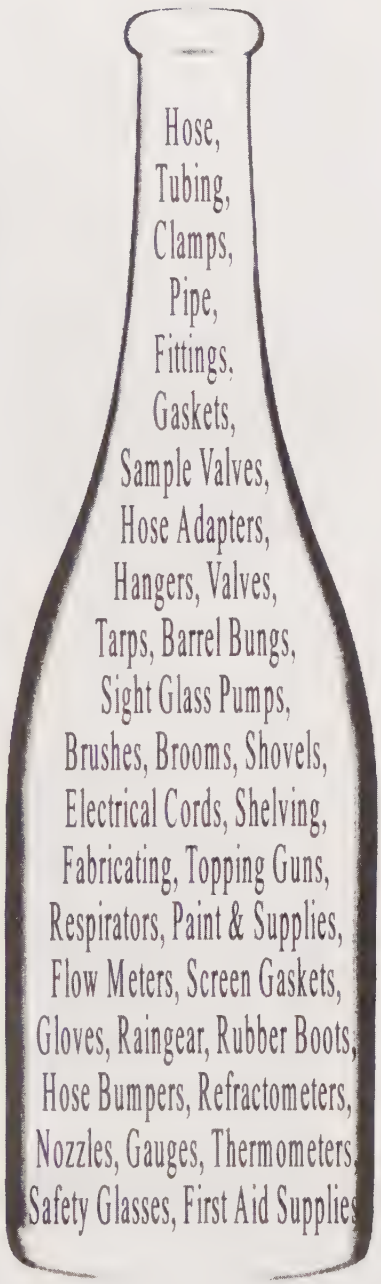

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Useful lifespan of new barrels, risk related to use of old barrels

BY Nicholas Vivas[1] and Nathalie Saint-Cricq de Gaulejac[2]

Wood contributes many compounds to wine: ellagitannins which play a crucial role in the oxidation reduction process, aromas of raw oak, and aromas generated by toasting the wood. The structure and chemical composition of old barrels undergo radical and irreversible changes during wine ageing.

Barrels can last much longer when the wood has been dried naturally than when it has been treated by more recently developed leaching methods. This is because the oak retains most of its extractable content when dried naturally. Of all existing barrel refurbishing methods, none is as satisfactory as keeping an old barrel full and taking good care of it from the start.

[1]Tonnellerie Demptos posted to the Centre of Study and Analysis of Organic Compounds, University Bordeaux 1, 351, cours de la Liberation 33405 Talence (France)

[2]Tonnellerie Demptos posted to the Faculty of Oenology, University Bordeaux

Introduction

Maturing wine in barrels is an important step in the production of quality wines and has many well-known advantages, including wine clarification and degassing (removal of excess CO_2), softening of tannins, stabilizing and darkening of color, providing aromas complementary to those of grapes, and stabilizing the colloid structure of wines.[2,5,7,1,7,9,10]

Although the need for barrels is widely recognized, it is nevertheless true that ageing wines in this fashion is a costly operation and only a certain portion of wine, rarely 100%, can benefit from new wood.

Tasting sessions at different stages of the ageing process show that barrels of different ages yield different positive and sometimes negative characteristics. Usually, contributions from wood and resulting oxidation reactions decline gradually as the barrel ages. Over the years, the wood characteristics imparted to the wine become less significant. This is a decisive factor when deciding what proportion of barrels must be replaced.

Besides the decrease in positive contributions from the wood, old barrels begin to add negative sensory elements that get worse with time if one is not careful.

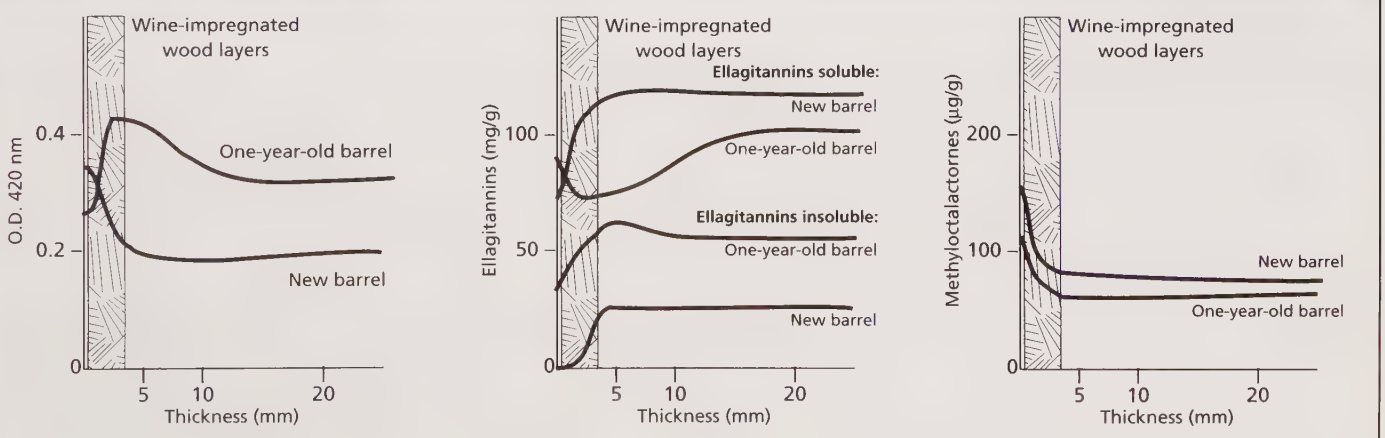
Thus, it is crucial for winemakers to understand and use enological techniques that make it possible to minimize the risks related to using old barrels. Moreover, it is important to know

Table I — Influence of age of barrel on its average chemical composition.
Average composition of wine-impregnated zones.

	Age (in years)			
	New	1	5	50
Ellagitannins (mg/g)	130	80	25	0
Polysaccharides[1] (mg/g)	780	650	350	120
Lignins[2]	16	12	8	3
Methyl-octalactone (µg/g)	85	64	5	0
Eugenol (µg/g)	14	6	2	0
Vanillin (µg/g)	18	11	4	2

[1]total polysaccharides (neutrals + acids)
[2]lignins easily extractable in hydroalcoholic medium

Figure 1 — Optical density 420 nm, ellagitannins and methyl-octalactones evolution from new or old staves (one-year-old barrel).



how to prepare old barrels that have been standing empty for any period of time before reuse.

Structure and composition of old barrels

Preliminary trials have shown that the structure of new oak can be changed by soaking it in alkaline and acid solutions.[10] Does wine, an acid-water-alcoholic medium, also induce such changes?

Electron microscopic examinations show that the wine-saturated layers (2 to 5 mm) in used oak barrels often display areas with visible polysaccharide microfibrils and intercellular gaps. This phenomenon is exactly like the effect a diluted solution of hydrochloric acid (HCI) has on wood. In addition, even greater changes can be observed in the wood's cell wall structure.

We know that the extraction of lignin induces the digestion of the middle lamella. This causes it to become unattached in such a way that the secondary walls no longer form a continuous layer between two adjacent cells. When part of the lignin is eliminated, the polysaccharidic structure of the surface of the cell wall becomes visible. The effect of dioxan on the wood's cell structure is similar to the effect of prolonged use of oak barrels for wine ageing.

It is generally considered that wine, unlike spirits,[3] does not damage the cellular structure of wood tissues.[4] However, our observations suggest that wine acts as a solvent in the extraction of polymers (lignins, polysaccharides) during ageing. For example, ellagitannins are extracted when wood tissues are impregnated with wine. These are very polar molecules located on the surface of the cell walls or found in a free state inside the cells; their release does not necessitate any alteration of the structure of the wood tissue.

Wine maturation causes major irreversible changes to the barrel wood composition. Obviously, the composition of that part of the stave in direct contact with the wine is modified (Table I). When a barrel has been in service for more than five years, few desirable compounds are still measurable, and the wood no longer contributes very much to the wine. But in the deeper layers, which are not impregnated with wine, significant changes also occur (Figure 1):

- The yellow hue of the wood measured at 420 nm increases after a barrel has been in service one year. The more yellow hue in the 0 to 3 mm zone is the result of toasting and the corresponding synthesis of chromophor, the nature of which is still unknown.
- At the same time as the deeper layers of the wood yellow, greater amounts of insoluble ellagitannins can

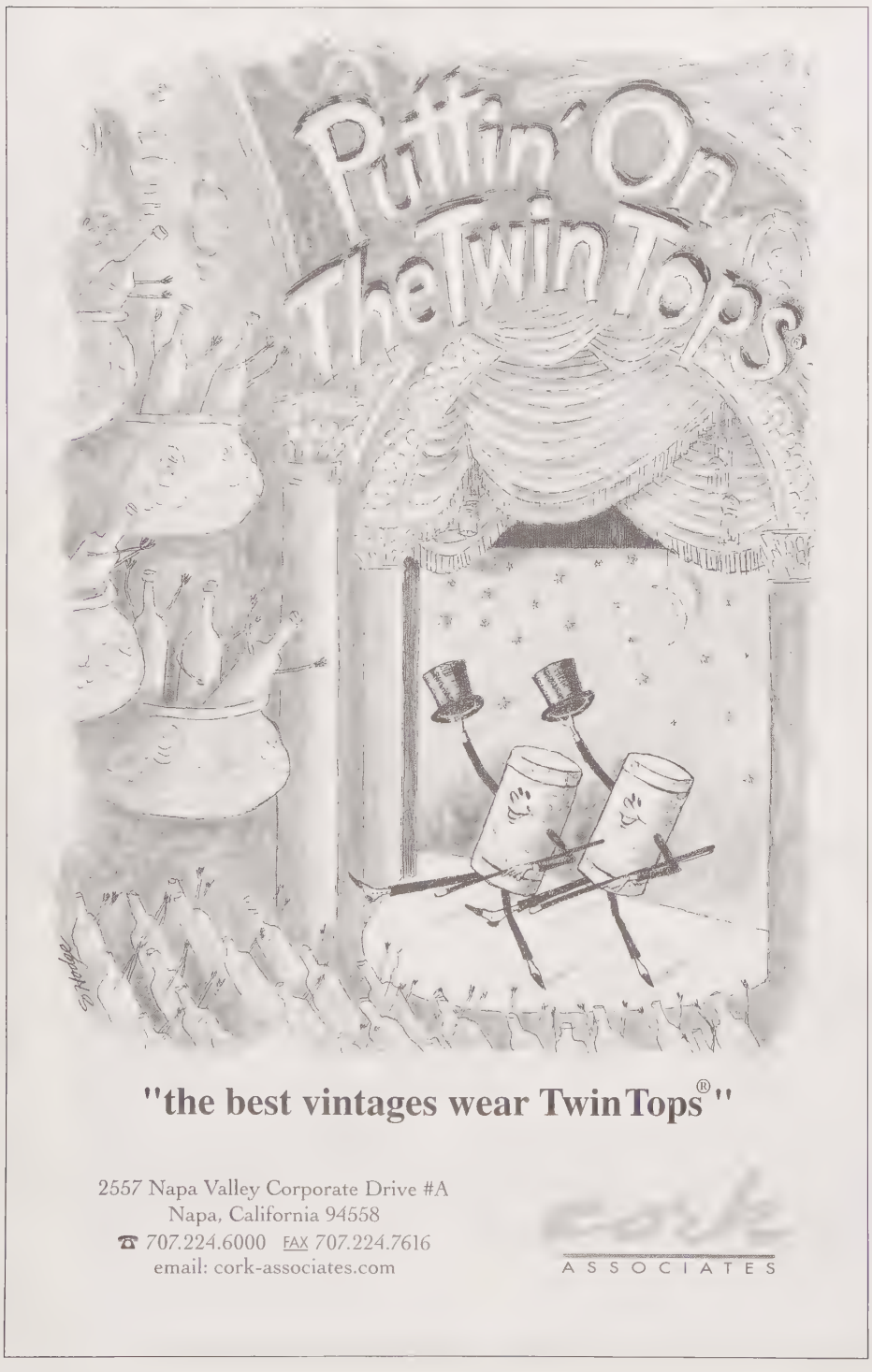


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Table II — Influence of ageing red wines in tanks, new versus old barrels (5 years) on color matter and color stability after bottling.

	Stainless steel tanks		New barrels		Old barrels	
	Ageing 12 months	Storage 2 yrs in bottles	Ageing 12 months	Storage 2 yrs in bottles	Ageing 12 months	Storage 2 yrs in bottles
Anthocyanins (g/L)	0.65	0.38	0.53	0.4	0.6	0.35
Tannins(g/L)	3.7	3.4	3.9	3.5	3.5	3.2
Color intensity	0.9	0.7	1.4	1.2	1.2	0.9
Hue	0.7	0.85	0.6	0.7	0.6	0.7
Origin of red color (in % of O.D. 520 nm)						
1-Free anthocyanins (dAl)	35	25	15	5	20	10
2-TA combination (dTA) discolored with SO_2	40	45	55	50	50	50
3-TA combination (dTAT) discolored with SO_2	25	30	30	45	30	40
% of red color attributed to stable combined form (dTA + dTAT)	60	75	85	95	70	90

be found in the wood, produced by the oxidation of the soluble fraction of ellagitannins. The presence of humidity (30%) partly explains this oxidation, which is catalyzed by catalytic cations naturally existing in traces in wood.

• The oak's aromatic composition is also changed. The concentrations of wood compounds, such as methyl-octalactones, slightly but measurably decrease throughout the stave profile (Figure 1). Oxidation reactions might explain this event.

• Acetic acid and tannin-harshening sulfates accumulate in the wine-impregnated wood mass, increasing total acidity. These products then accumulate in wines that are aged in old barrels (Figure 2). Soaking barrels with water and sulfur dioxide for three or four days before reuse is an adequate and proven remedy in most cases.[8]

There is however another problem. During the ageing process, some of the

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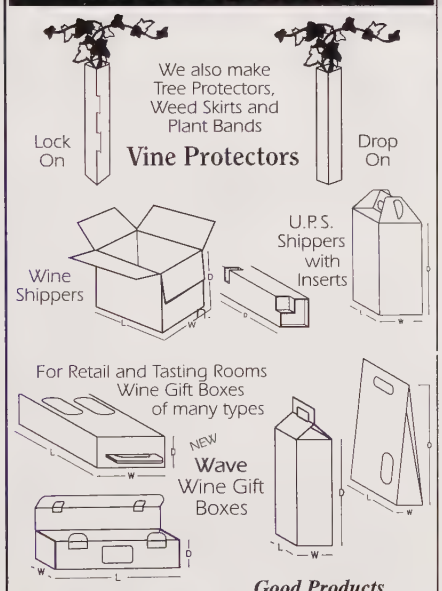
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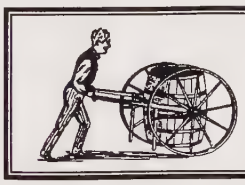

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Figure 2 — Influence of type of container and preparation method used on volatile acidity, sulfate and dimethyl sulphide contents in a red wine (analysis after 12 months ageing in the same place).

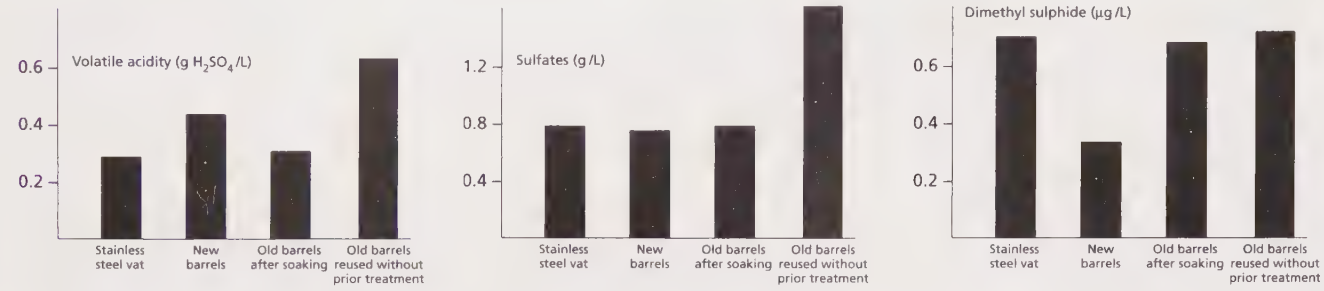

Figure 3 — Influence of container on dissolved oxygen content and average redox potential in red wines over a period of five years.

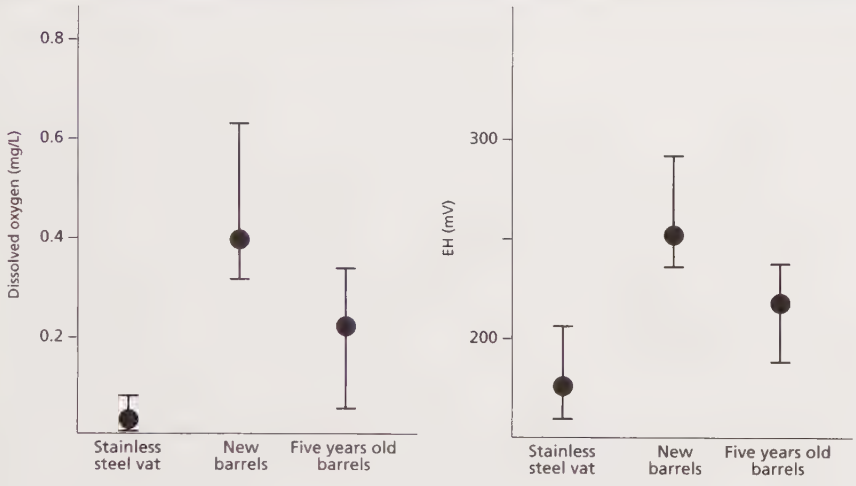

Table III — Influence of scraping and possible re-toasting of barrels on wood contributions to wine.

	BARRELS			
	New	Old 5 yrs	Refurbished Scraped	Refurbished Scraped + re-toasted
Ellagitannins (mg/L)	97	0	43	24
Furanes derivates (mg/L)	8.5	t	t	13.6
Methy-loctalactone (µg/L)	184	15	124	142
Eugenol (µg/L)	26	4	3	6
Vanillin (µg/L)	315	42	39	170
Methy-lphenols (µg/L)	3	t	t	47
Dimethoxy-phenols (µg/L)	28	13	6	486

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thiols (sulfur-containing compounds) undergo hydrolysis, producing dimethyl sulphide which may increase during wine ageing. Generally, the dimethyl sulphide content is lower in new barrels than in old barrels or in tanks (Figure 2).

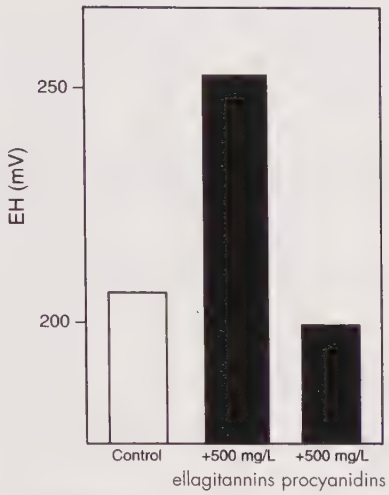
Influence of barrel age on degree of normal oxidation reduction reactions — Role of ellagitannins

Repeated experiments have shown that ageing of wine in barrels has a favorable effect on wine stabilization processes (Table II).[5] Ageing red wines in new barrels usually enhances the red hue; the color substances are stabilized when they combine with grape tannins. In fact, after one-year maturation, most of the color substances are found in these stable forms that ensure color-stability once the wine is bottled.

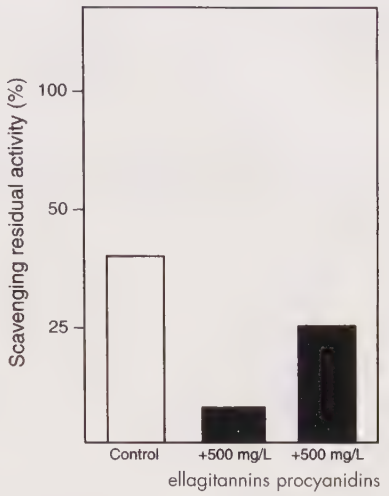
On the other hand, when wines are aged in tanks, there is only a slight increase in color intensity and fewer anthocyanin-tannin combinations occur (60% against 85% in new barrels). When aged in bottles, the hue intensifies indicating the premature development of a brick-red color. In five-year-old barrels, the color intensity is midway between what ageing in tanks and bottle ageing produce. The redox reactions have gradually dwindled, but persist nevertheless.

But other dangers loom ahead. Tannins also undergo major changes. Controlled oxidation produces ethanol which acts as a focal point for the condensation of tannins; in most cases, the degree of condensation of tannins increases and their astringency drops. Here again, prolonged use of old barrels leads to a gradual decline in oxidation-reduction reactions, resulting in a decreased redox potential often followed by a sharp drop in the dissolved oxygen content (Figure 3).

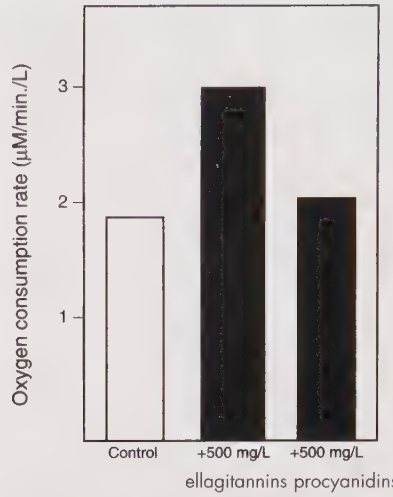
Figure 4 — A few properties of ellagitannins. Comparisons with grape proanthocyanidins. Experiments performed in a Merlot Noir wine.



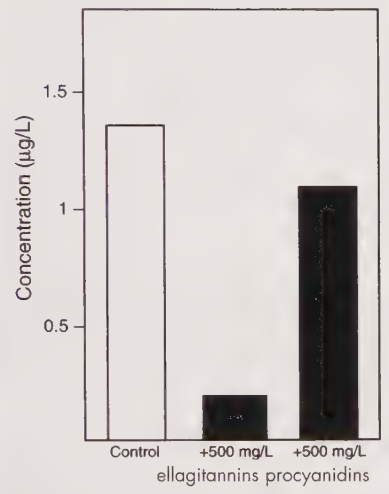
a) influence on redox potential. Measurement performed after 24 hours stabilization with nitrogen bubbling.



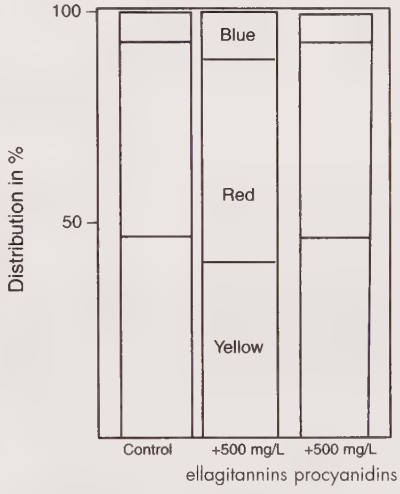
b) influence on antiradical activity. Measurement performed with xanthine/xanthine oxydase system.



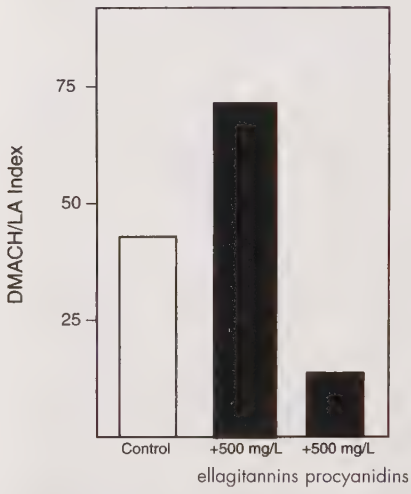
c) influence on initial dissolved oxygen consumption rate. Measurement performed in thermostatic controlled room.



d) impact on off-flavor thiols. Measurement performed on methanethiol adjusted to 1.4 µg/L. Results after 72 hour period and a consumption of 5mg O_2/L.



e) impact on color. Measurement performed 30 days after addition of tannins. Kept away from oxygen. Distribution in %.



f) influence on the degree of tannin condensation. Measurement performed after 30 days away from oxygen. DMACH method. DMACH/LA index.

In addition to a different oxidation status, older barrels also produce different amounts of ellagitannins in solution. These wood-generated molecules are far better reducing agents and are far more effective radical scavengers than grape tannins (Saint-Cricq de Gaulejac *et al.* 1998). These properties give them very special qualities (Figure 4).

• Ellagitannins alone intensify the redox potential without the help of dissolved oxygen (Figure 4a). As a result, they make the wine more oxidizable, promoting the whole array of oxidation reactions.

• Ellagitannins protect wine constituents from oxidation by free radicals (Figure 4b). Ellagitannins are able to capture oxygen and make use of it in a number of reactions. Their oxygen consumption rate is extremely high, higher than grape tannins (Figure 4c).

• These basic characteristics result in the degradation of foul-smelling thiols and limit the "reduced" character of wine somewhat (Figure 4d). Furthermore, they guarantee a favorable evolution of the wine color, with deep red and blue-mauve hues predominating, giving wine a brighter, yet deeper color (Figure 4e). Finally, because of the formation of ethanol resulting from oxygen consumption, ellagitannins increase the polymerization of grape tannins, reducing their astringency (Figure 4f).

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Evolution of contributions from wood to wine during prolonged barrel use

An important feature to consider when reusing barrels is the loss of the supply of wood substances to the wine. Ellagitannins, whose role in ageing we have shown to be fundamental, lose practically all effectiveness after barrels have been in use for three years, mainly because their concentration becomes limited. After three years, all have been extracted.

It should be noted that toasting can help increase the supply of ellagitannins. With a heavy toast, even if the

Figure 5 — Evolution of wood tannin in wine during barrel use.

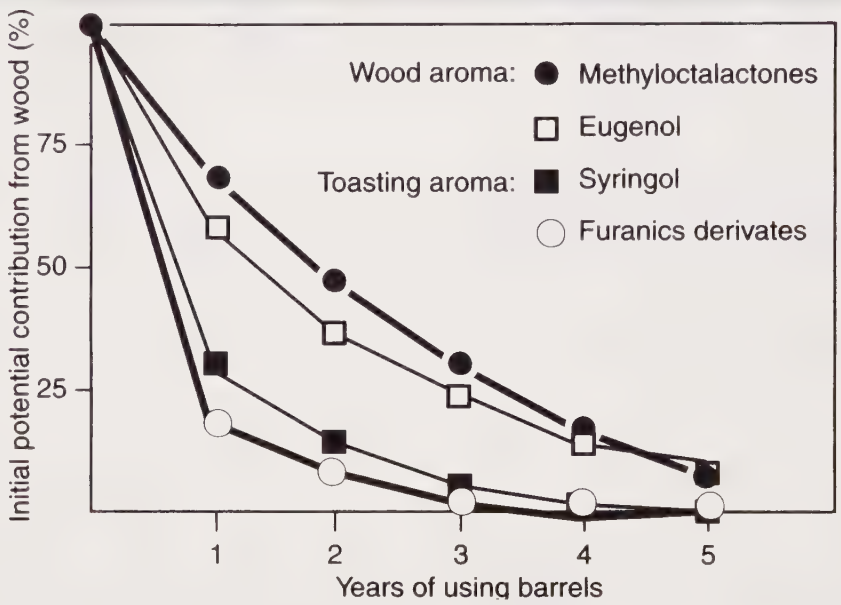
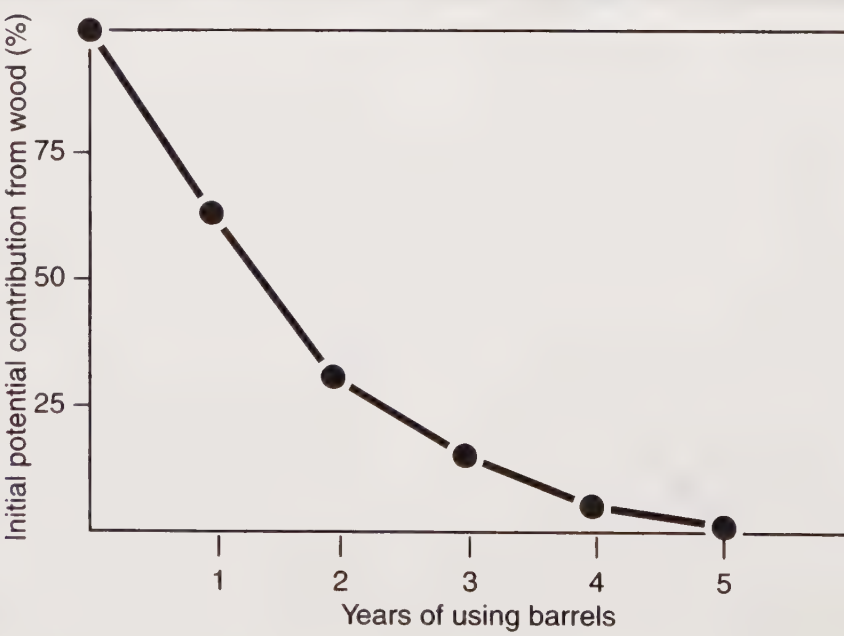


Figure 6 — Evolution of aromatic compounds from wood to wine during barrel use.



ellagitannin content in the scorched layers is low, a number of micro-fissures develop on the surface of the staves; over time, these microfissures allow more tannins to be released from deeper in the wood. The best explanation for this is that the wine gains better access to the wood mass.

The aroma compounds behave differently according to where they originated in the wood or the toast. Wood aromas are released regularly and can contribute significantly to wine aromas for three to four years of barrel use. On the other hand, toast aromas are only found in the first 3-mm of the stave exposed to the burner. Accordingly, very few toasting aromas are found in the nose of a wine aged in barrels that have already been used for two years.

Another factor that should also be considered is the way the wood is matured. By measuring specific wood components, various well-grounded observations can be made in favor of a natural drying (air-dried) process (Figures 5, 6, and 7). One can readily understand that wood that has been speedily dried through leaching produces staves whose positive or negative extractable substances are exhausted.

A well-managed natural drying process, however, allows the wood to continue supplying compounds to wine even after the first year. This is confirmed by repeated tastings conducted in the world's major wineries. Obviously, the wood is rather harsh in the first year, but this lessens as the barrel ages.

Blending wines also mitigates this harshness, and a wine is rarely aged in a complete set of new barrels.

This is reserved for the richest wines with good balance and exceptional ageing (and return-on-investment) potential. Finally, one should never judge the quality of the wood before at least six months' maturation of the wine in barrel.

Optimizing the useful lifespan of barrels, review of different refurbishing methods

There are many methods to give old barrels a new lease on life. Old barrels

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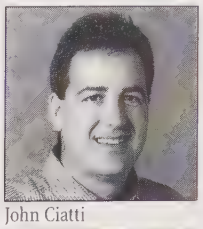
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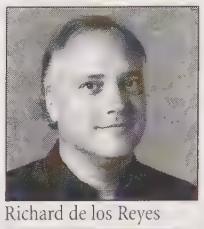
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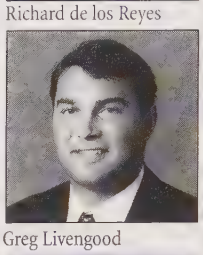
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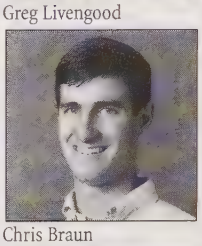
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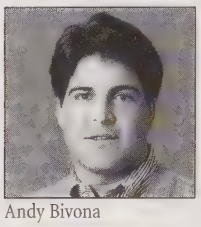
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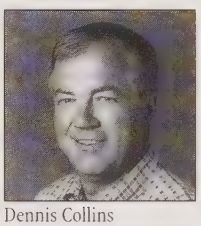
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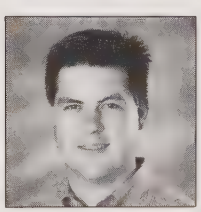
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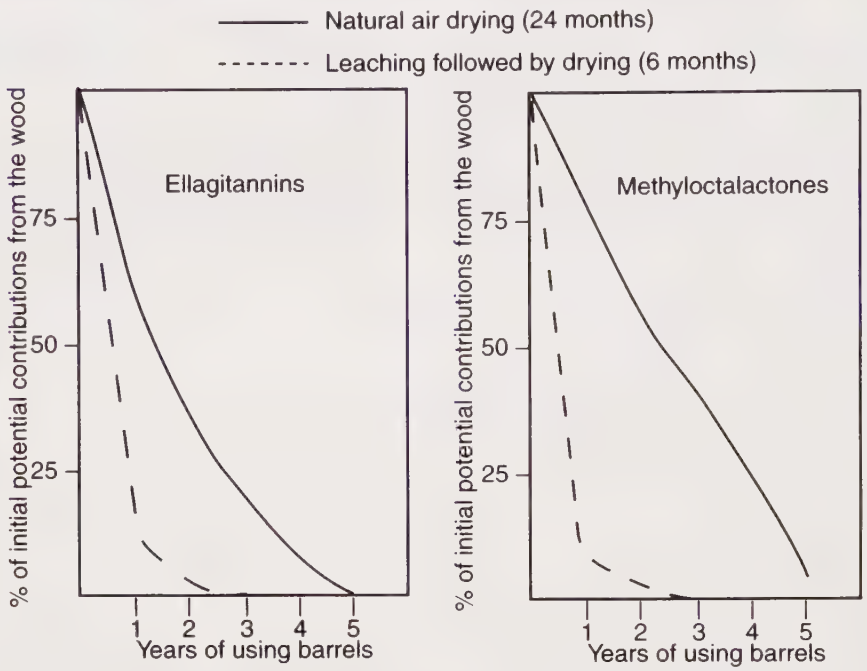
Figure 7 — Influence of wood maturation methods on the evolution of wood contribution to wine during barrel use.



have undergone profound and irreversible changes. In these conditions, any form of refurbishing might appear to be illusory. The best technique is said to consist of replacing the old headings and a few staves with new oak; but the cost of this operation rapidly makes it unprofitable.

Commonly, barrels are refurbished by scraping the barrel to eliminate the wine-stained layer. Sometimes this is followed by a second toast. Scraping does help boost the supply of certain wood substances to wine; however, the oxidation reactions within the scraped staves do not yield the same results as those within a new barrel (Table III).

In addition, a second toast is unsatisfactory. A 225-liter barrel can absorb five liters of wine. The substances contained in the absorbed wine undergo pyrolysis during a second toast. The result is an accumulation of methylphenols and dimethoxyphenols, which gives any wine subsequently put into the barrel the characteristics of burnt rubber and bitumen. The French term *crame* (burnt) is used to describe this smell.

The best refurbishing technique for old barrels can probably be summarized in three points:

- Have your own stock of old barrels to avoid importing any additional risk;
- If possible, develop a rotation system for wines to ensure that barrels remain empty for the shortest possible time;
- If old barrels have been standing empty for several months, soak them for several days, using water and sulfur dioxide.

After thoroughly draining the barrel, subject it to gaseous sulphiting, using a sulfur wick or SO_2 gas before filling it again. ■

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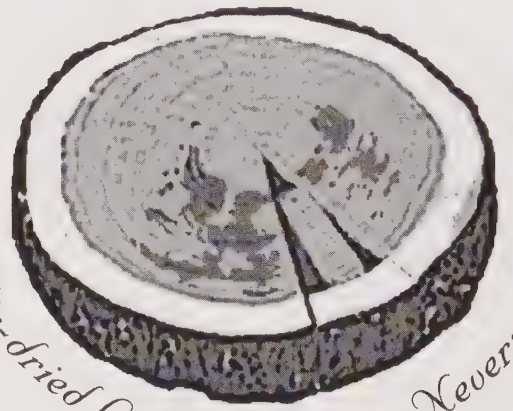

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ECONOMICS OF VINEYARD DESIGN:
Vine and row spacing, trellising

BY Stan Grant • Director of Farming
Duarte Nursery, Inc., Hughson, CA

These are dynamic times in the winegrape industry. As demand for high-quality grapes rapidly increases, many wineries and growers are looking to expand production. Vineyard development is expensive, and available land for production of high-quality grapes is limited. Successful expansion under these circumstances requires careful planning and cost assessment.

In addition to soil preparation, scion variety, and rootstock, vineyard design considerations are among the most important decisions growers must make when optimizing current sites or developing new vineyard sites.

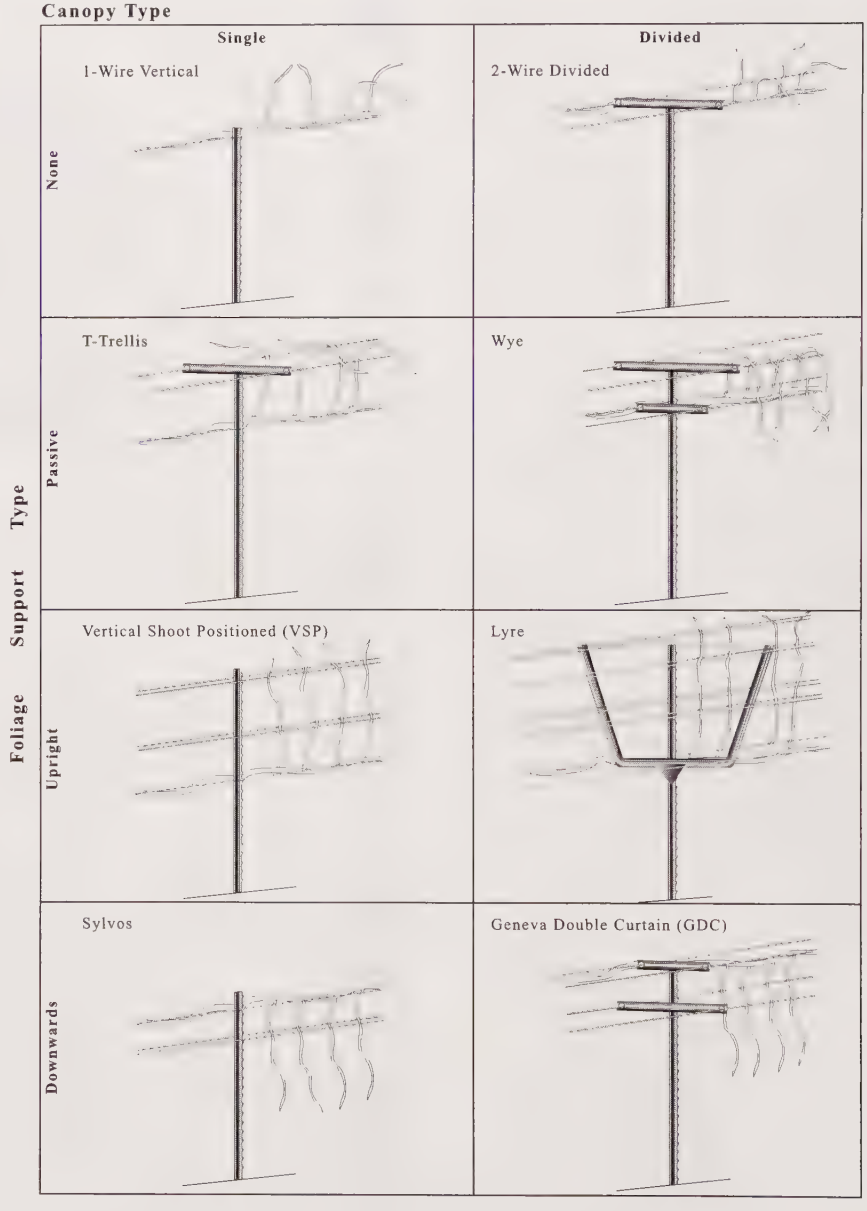
Trellising and spacing between vines and vine-rows influence fruit quality and marketability. In addition, they determine vineyard development and operational costs, the promptness of return on investment, and the average rate of return during the vineyard's lifetime.

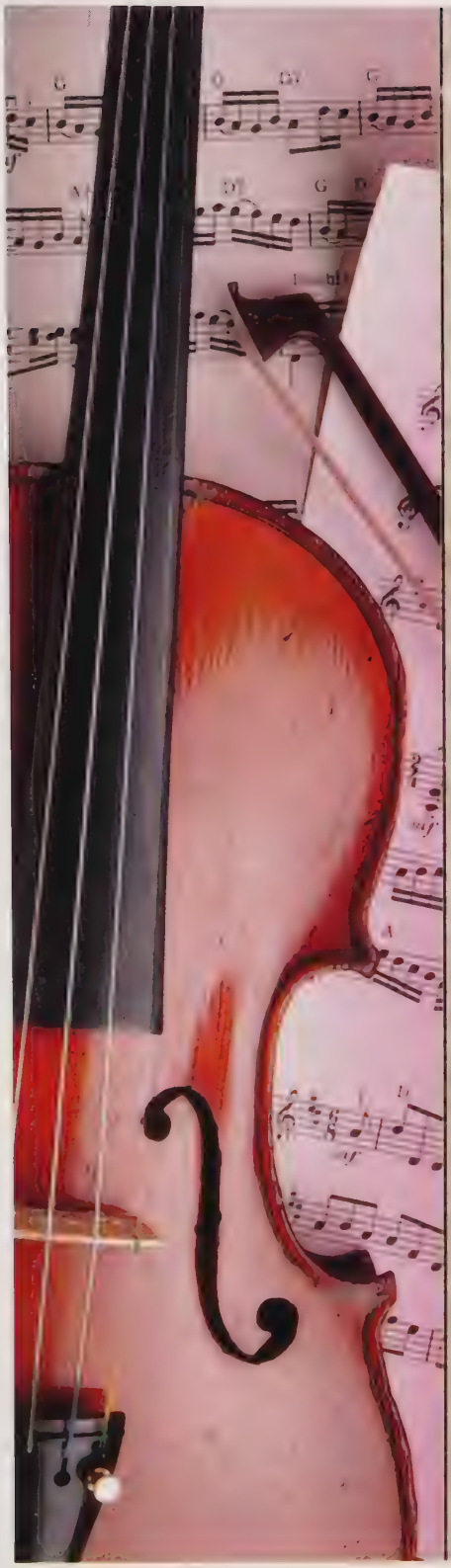
Using production data from viticultural literature and a fictitious model vineyard, we can evaluate expected rate of return relative to initial vineyard development costs. Use the model vineyard — which has a traditional California winegrape-growing design — as a baseline for comparing other possible vineyard designs to determine which one will work best at your site.[25]

Vineyard model

The model vineyard occupies 20 square acres (933.4 ft. per side) and is planted with bench grafts in a vine and row spacing of 8-feet by 12-feet. Initial cost per acre for developing this model vineyard is likely to be somewhat higher than the cost for developing larger vineyards and somewhat lower

Figure 1 — Trellis systems by canopy and foliage-support type.





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than for smaller vineyards due to variations in the ratio of number of rows to row length and number of end posts per acre.

Vines are bilateral cordon-trained on a T-trellis composed of 7-foot stakes with 18-inch crossarms attached at the top alternating with 5-foot stakes without crossarms. All stakes are T-stakes made of 125- or 95-weight rail steel for 7-foot and 5-foot lengths, respectively. Crossarms are 14-gauge steel. End posts are 9-foot, recycled well stems with a spade. Cordons are attached to a single 12-gauge wire, and a 14-gauge wire on each end of the crossarm supports the foliage. All wires are high-tensile, galvanized steel.

The model vineyard is drip irrigated. The drip hose includes in-line, pressure-compensated, 0.5-GPH emitters three feet apart. It is attached to a 14-gauge wire by "pigtail"-type clips at three-foot intervals between the emitters. In this model, vineyard development costs other than trellis, irrigation system, vines, and planting are considered constant.

Vineyard development costs used in this economic analysis are those Duarte Nursery incurred in 1997 and 1998 while developing its vineyards in the Linden Hills area of San Joaquin County. The material costs (grapevines, trellis, and drip irrigation) are representative of most of California. Labor costs used in the study are representative of the interior valleys and are lower than in many coastal areas.

Trellising

In the recent past, only a few trellis types have been used to support winegrape vines in California. Among the simplest of these is the one-wire vertical trellis (Figure I). It consists of a single wire fastened to the top of a stake onto which cordons or canes are trained and attached.

A T-trellis is more elaborate, and it is the trellis of our model vineyard. Normally the T-trellis consists of some alternating pattern of short and tall stakes (*e.g.* one short, one tall) with a cordon or cane wire fastened to the tops of the short stakes and to the sides of the tall stakes (Figure I). At the top of the tall stakes a crossarm is attached, and wires are fastened to the ends of the crossarms to provide passive shoot positioning and foliage support.

While traditional trellis designs are often still appropriate for many vineyard applications, experimentation and experience have shown that, under some conditions, other types of trellising can improve fruit yield and quality.

In cooler winegrape growing areas, the vertical shoot-positioned (VSP) trellis is used to invigorate shoots and assure buds and fruit are adequately exposed to sunlight. This trellis consists of very short stakes and very tall stakes arranged in some alternating

Shown much larger than actual size below is the face of a Roman antoninianus, a coin minted during the reign of emperor Probus (pictured) circa a.d. 276 to 282. A great lover of wine, Probus led conquests into Gaul and found a region he believed held great potential for vineyards. He instructed his men to cultivate the ground and with perseverance succeeded in making truly unique wine. His men weren't as enthusiastic, and eventually killed him out of a rage for being forced to make agriculture instead of war. Those original vineyards were the seeds for the terrain known today as the Bordeaux region of France.

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pattern with cordon or cane wires attached to the tops of the short stakes and to the sides of the tall stakes as with the T-trellis (Figure I). Wire clips (usually two J-R type) or very short crossarms are fastened to the tall stakes at intervals above the cordon wire, and pairs of wires are attached at each end of the clips or crossarms during the growing season to position shoots into a vertical plane in line with the stakes.

Where sunlight is not too intense during the growing season but shoots grow vigorously, vines are sometimes devigorated by downward shoot positioning. The Sylvoz or Hudson River Umbrella (HRU) trellis was designed for this purpose. It is very similar to the one-wire vertical trellis with only a few minor differences (Figure I).

First, the stakes are taller, so cordons or canes are higher above the ground. This allows vertical space for the shoots below the cordon. Also every second or third stake is taller still, so a pair of wires may be temporarily attached near its top and above the cordon during the early part of the growing season. After the shoots are long enough, these wires are brought down on either side of the trellis, and the weight of the wires is used to hold the shoots downward. Sometimes the wires are attached to a short crossarm.

Cordons or canes are the bearing surface of vineyards. That is, they are the location for both the apparatus for capturing sunlight and converting it into chemical energy (*i.e.* the leaves) and for the products of the vines work (*i.e.* the fruit). The trellises described above all have cordons in a single line within the vine row with the foliage forming a single canopy.

Many vineyard sites have the potential to grow more leaves and produce more fruit than a single line of cordons will allow. This potential can be realized by dividing or splitting the canopy to form two parallel bearing surfaces within the vine row. This is most easily accomplished by use of a crossarm with wires on each end to support cordons. Either two or four cordons are trained and attached on the wires. Typically, the vines within the rows of vineyards with divided canopies are planted more closely together than vines within the rows of vineyards with single canopies to avoid overcropping of individual vines.

As with single canopies, the foliage of divided canopies may have no support or may be positioned passively, vertically, or downward. The corresponding trellises for these types of foliage support or positioning are the two-wire divided, Wye, Lyre, and Geneva Double Curtain (GDC), respectively (Figure I).

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Trellis costs

Particular requirements of the site, grape variety, mechanization, budget, winery and grower perceptions, and other factors affect trellis materials, design, and construction. However, in the following economic analysis, the trellises are designed to have as many features in common as possible, fully realizing that, for a few trellises, other designs may be more common and less expensive. As each is discussed, we will also examine some alternate design features that can reduce the cost of more elaborate trellises.

The T-trellis described in this model vineyard is the base reference, and all other trellises in this economic model have been designed to be as similar to it as possible (Table I). Like the model T-trellis, all these trellises with foliage support (VSP, Wye, Lyre) have a foliage support apparatus on every other stake. Metal T-stakes, which cost about 9% more than wood (95 rail steel compared to 2 in. x 2 in. pressure-treated Douglas fir), are used for all trellises. All cordon wires are 12-gauge steel, and all foliage-support wires are 14-gauge. J-R clips are used to hold foliage wires of the two trellises with vertical foliage support (VSP and Lyre).

Eliminating the foliage support of the T-trellis to make a one-wire vertical trellis reduces initial cost negligibly (Table II). Cost of the VSP and Sylvoz are only about 10% more than the cost of the T-trellis. The slightly higher costs of these trellises are due to additional wires, clips, and tensioners and their installation and to more expensive stakes. Since costs are similar for all of the single-canopy trellises, other factors, such as extent of fruit exposure and adaptability to mechanization, are more important and should determine which single-canopy trellis you choose.

Cost for the two-wire divided, Wye, and GDC trellising are 206% to 228% more than for the T-trellis (Table II). Typically, the Wye system has foliage support on every third stake, which will reduce its cost relative to the T-trellis by an additional 10%.

Cost of the Lyre trellis in this analysis is 360% greater than the cost of the T-trellis, principally because of the high cost of the Lyre crossarms. In practice,

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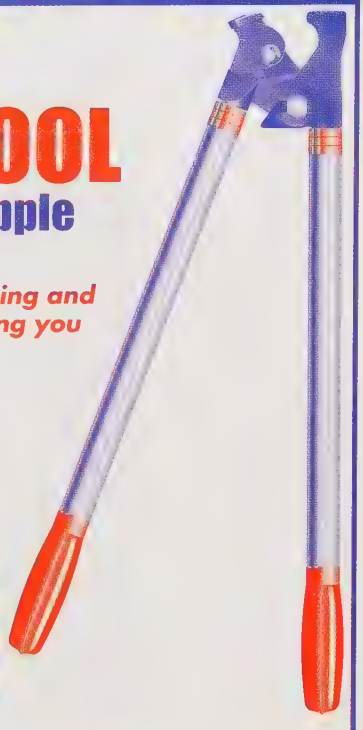
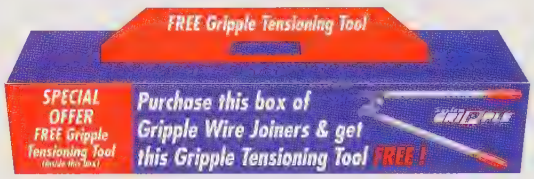
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Table I — Components of grapevine trellises included in a vineyard development economic analysis

Trellis	Canopy type	Shoot positioning	Percent of stakes[a] 5ft	6ft	7ft	8ft	Percent of crossarms 18in	24in	36in	42in	Lyre[b]	Number of wires per row: Fruit / cordon 12 gauge[c]	Stationary foilage 14 gauge[d]	Moveable foilage 14 gauge[e]
1-wire vertical	Single	None	0	0	100	0	0	0	0	0	0	1	0	0
T-trellis	Single	Crossarm	0	50	50	0	50	0	0	0	0	1	2	0
VSP	Single	Upward	50	0	0	50	0	0	0	0	0	1	0	4
Sylvos	Single	Downward	0	0	50	50	0	0	0	0	0	1	0	2
2-wire divided	Divided	None	0	0	100	0	0	0	100	0	0	2	0	0
Wye	Divided	Crossarm	0	50	50	0	0	100	0	50	0	2	2	0
Lyre	Divided	Upward	50	0	50	0	0	0	0	0	50	2	0	8
GDC	Divided	Downward	0	0	100	0	0	100	0	0	0	2	0	2

a Five ft. and 6 ft. stakes are 95 weight rail steel. Seven ft. and eight ft. are 125 weight rail steel and have spades.
b Lyre crossarm formed from 125 T-stake material.
c Wire clips required to attach wire to stake for single canopy trellises.
d All trellis systems have one stationary wire clipped about 18 in. above the soil for attaching the drip hose.
e Requires JR clips for shoot positioning wires on VSP and Lyre trellises.

the Lyre trellis is usually constructed less expensively. Often crossarms are spaced further apart in the row, for example, at every third or fourth vine. These arrangements reduce Lyre trellis cost by 18% or 28%, respectively. The increased distance results in less fruit-wire support within the vine row and greater tension on the end posts. More elaborate end-post assemblies are usually required to accommodate the added wire tension, which consumes about 2% or 3% of the savings from further crossarm spacing.

Another cost-saving measure for the Lyre trellis is the substitution of rebar (⅜-inch diameter) or some other metal rod, wooden stick, or twine and anchor combination for the stakes that do not have crossarms. The rebar substitution further reduces the trellis cost by 23%. These substitutions, which are also sometimes used with the VSP trellis, decrease development costs substantially, but Lyre trellis costs still remain 30% to 70% more than Wye or GDC trellis costs. Such modification also limits mechanical harvest methods to bow-rod harvesting, because the trellis will not be sufficiently rigid for trunk-shaker harvesting.

Table II — Grapevine trellis costs/acre. Trellis costs relative to T trellis costs, and relative trellis materials and labor costs.

Trellis	Cost/ acre $	Percent T-trellis: Total	Materials	Labor	Percent of total cost: Materials	Labor
1-wire vertical	2,084.	99	106	88	64	36
T-trellis	2,113.	100	100	100	59	41
VSP	2,268.	107	110	103	61	39
Sylvos	2,352.	111	122	96	65	35
2-wire divided	4,528.	214	276	125	76	24
Wye	4,353.	206	250	141	72	28
Lyre	7,603.	360	500	155	82	18
GDC	4,808.	228	287	141	75	25

While crossarms are the largest material cost for the Lyre trellis, stakes are the largest material cost for other trellises (Figure II). Excluding the Lyre trellis, stake costs range between 57% and 86% of the total trellis material costs. Crossarms, however, generally comprise a large portion of the material costs of divided canopy trellises (60% for the Lyre and about 30% for the others). End posts, wire, clips, and tensioners form a small portion of single-canopy trellis material costs and an even smaller portion of divided-canopy trellis material costs.

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End-post installation is the most expensive labor cost, accounting for 45% to 78% of the total labor cost (Figure 3). The relative labor cost to install stakes is similar for all the trellises, but it is slightly more for divided-canopy compared to single-canopy trellises (about 15% and 21%, respectively).

Crossarm installation accounts for 12% to 19% of the cost of divided-canopy trellis installation, but it is only a small part of T-trellis installation (about 5%). The cost to install wires, clips, and tensioners varies proportionately with their number and is least for trellises with no foliage support (*i.e.* one-wire vertical and two-wire divided) and most for trellises with upward shoot positioning (such as VSP and Lyre).

Returns on trellis investment

Although type of foliage support has been shown to affect fruit yield,[5] it is considered mainly a fruit quality factor, and therefore, assigning a monetary value to it is difficult. Selection of foliage-support type usually depends on regional climate, perceived fruit-quality benefits, or grower or winery preference rather than production economics.

Fruit perceived to be, or demonstrated to be, of superior quality due to foliage support is most easily marketed to wineries and, consequently, has a definite economic advantage for the grower.

A final economic consideration regarding foliage-support type involves operational costs. Some elaborate trellising may limit mechanization of some vineyard operations. For example mechanical prepruning, which may reduce pruning costs by 35% to 80%,[4, 7, 14, 21] is currently not possible with most Lyre trellises because of horizontal supports across the top of the crossarm.

Fruit quality can be enhanced by canopy division, particularly if it decreases shoot density and leaf layers in the fruit zone,[20] but it is considered primarily a production factor. Under conditions of sufficient sunlight atmospheric heat, soil depth, soil moisture, and soil fertility, a divided-canopy trellis may yield up to 85% more fruit than a single canopy.[5, 11, 15, 16, 17, 19] In addition, under these conditions a divided-canopy vineyard will produce larger quantities of fruit *earlier* in the vineyard's life than it would as a single canopy.

However, some operational costs involved with crop and foliage for divided-canopy trellises will increase substantially, perhaps nearly doubling. The most prominent examples include

Figure 2 — Relative costs of grapevine trellis materials.

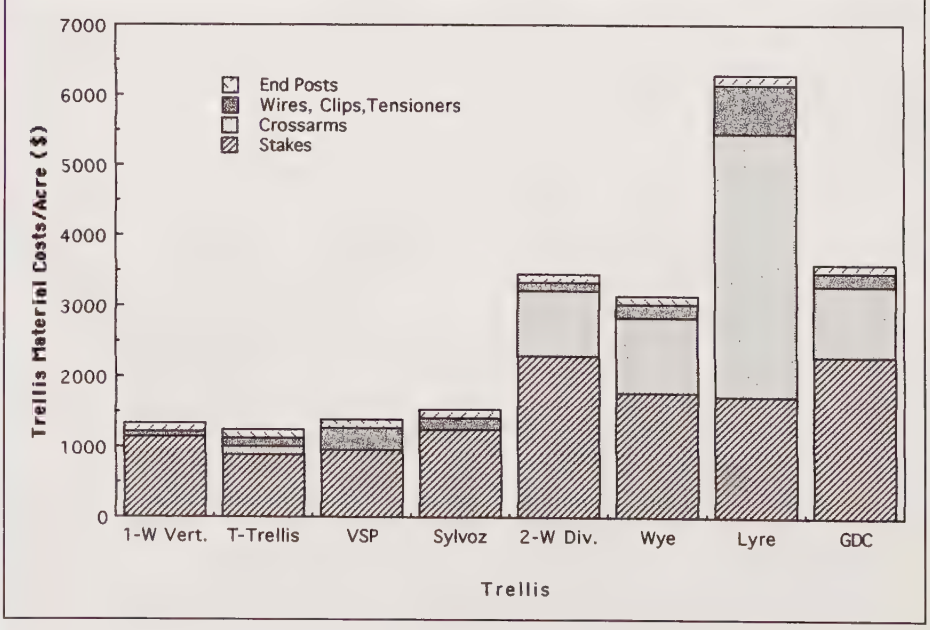
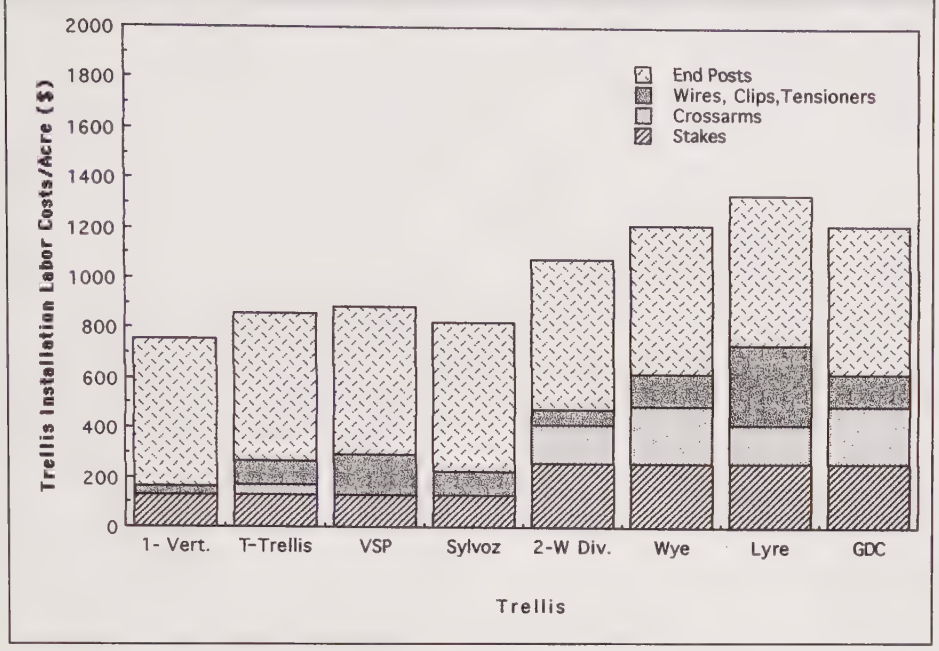


Figure 3 — Relative labor costs for installing grapevine trellises



hand operations such as pruning, shoot thinning, and crop thinning. (Again, mechanical prepruning can help to reduce the cost of hand pruning.)

Still, in the majority of cases, the incremental returns from increased fruit production from canopy division will be much larger than the incremental cost increases in vineyard development and operations. For example, a Wye-trellis vineyard in a high-capacity site will cost about 106% more per acre to develop (for trellis and training) and about 10% more per acre to operate (for pruning, shoot thinning, and crop thinning) compared to the same vineyard with a T-trellis, but it will generate about 85% more revenue per acre.

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result in an increase in development and operational costs during the first 15 years of about $4,390 per acre, but revenues over that period could increase by about $63,750 per acre.

Vine Spacing

Unless in-row vine spacings are either extremely narrow or wide, they usually have a much larger effect on yield per vine than they do on yield per acre (Figures 3 and 4). Therefore, the economics of established vineyards are usually not greatly affected by in-row vine spacing.

There are, however, two exceptions. The contribution of each vine to the overall vineyard yield increases with more space between vines. As a result, missing vines have a greater impact on yield per acre and vineyard revenues in vineyards with wider spacings than with narrower spacings. Missing vines are of minor consequence for the vast majority of vineyards. Wider-spaced vineyards have an additional disadvantage, however. They normally come into production more slowly than narrower-spaced vineyards and, therefore, have a later return on investment[22].

There are viticultural considerations regarding vine spacing beyond yield and rate of return. First, for any given variety, site, and set of management practices, excessive foliage and canopy density are problems when the vine spacing is too narrow, and insufficient foliage and overcropping are problems when the vine spacing is too wide.

Both of these extreme conditions are detrimental to fruit yield and quality and usually produce other undesirable side effects. They also result in increased operational costs for extra canopy management (*e.g.* hedging and leaf removal) or extra water, fertilizer, and crop management (*e.g.* cluster thinning) for excessively narrow and wide vine spacing, respectively. Therefore, they should be avoided.

In California, the most common vine spacings for single-canopy trellises range from six feet to eight feet (recall that eight feet is the vine spacing of our model vineyard), although both narrower and wider spacings can easily be found. Frequently these same common vine spacings are used in divided-canopy vineyards, but not always with satisfactory results.

Some grapegrowers with divided-canopy vineyards spaced at six feet to eight feet find that their fruit ripens later and is of lower quality than their neighbors' single-canopy vineyards with similar vine spacing. These are the results of overcropping, which can be avoided by using narrower vine spacings (four feet or five feet).

In the model vineyard, development costs per acre decrease by $2,325 (from $5,234 to $2,909) as in-row vine spacing increases from four feet to 10 feet (Figure 6). With more space between

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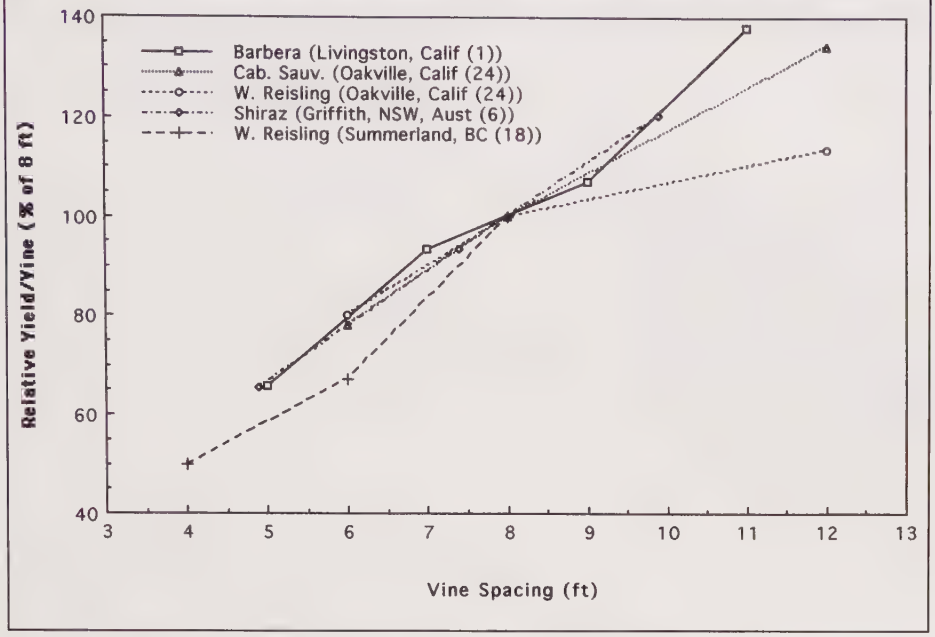
Figure 4 — Effect of vine spacing on relative grape yield per vine.



vines, the relative costs of vines, planting, and trellising decrease, while the cost for drip irrigation remains constant. The rate of return during a vineyard's early years will have to exceed the increased development cost of narrower spacing to make it the best economic alternative. This would only be possible if early yields or crop value, or both, were sufficiently high.

Row Spacing

Reducing the distance between rows of vines from 12 feet to 10 feet to 8 feet increases the number of rows per square acre from 17 to 21 to 26, respectively. This relationship between rows per acre and row spacing is nearly linear with the number of rows per acre increasing by about two for every foot the space between rows decreases. How narrow the spacing between rows can be is limited only by the width of available vineyard machinery.

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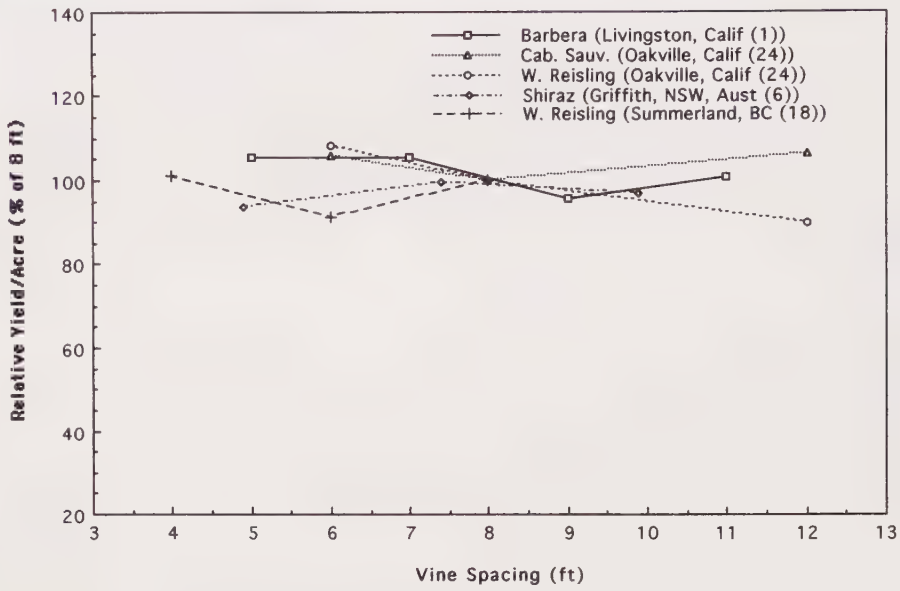
There is a positive relationship between the number of rows per acre and relative yield per acre (Figure 7). Thus, row spacing is an important vineyard production factor. There is no evidence that row spacing is a fruit quality factor. Given that rows per acre and vines per acre increase proportionately with narrowness of row spacing, it follows that operational costs increase proportionately with narrower spacing between rows.

Development costs for the model vineyard also increase with decreasing space between vine rows. Costs increase by $1,700 per acre (from $3,350 per acre to $5,050 per acre) when decreasing space between vine rows from 12 feet to eight feet (Figure 8). However, for all spacings between vine rows, the relative costs for vines and planting (36%), trellis (40%), and drip irrigation (24%) remained constant.

Relative yield and development costs for different spacing between vine rows are roughly proportionate. That is, for the initial expenditure in vineyard development with narrower row spacing, there is a return in gross revenues that continues over the lifetime of the vineyard and pays for itself several times.

Figure 5 — Effect of vine spacing on relative grape yield per acre.



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Relating vineyard design factors

Vineyards are horticultural systems with multiple design elements that influence vine growth, fruit production, and fruit quality. These elements also influence development costs, operational costs, and rate of return. Some of them are independent and others are interrelated.

Because row spacing normally has a negligible influence on other vineyard design elements, it is an independent factor. In-row vine spacing influences the extent of fruit- and foliage-bearing area, while trellising affects the position of the fruit and foliage bearing area in space. It is the fruit- and foliage-bearing area connection that relates vine spacing and trellising.

Costs of vine spacing and trellising can be evaluated together, using the information presented here. Start by selecting a trellis. In Table II find the cost of the trellis. Calculate the trellis cost rel-

ative to the T-trellis by dividing by 2,113. Find the development cost for the vine spacing in Figure 6 and multiply it by the relative trellis cost quotient to obtain the cost estimate for vineyard development, less land preparation. ■

Figure 6 — Effect of vine spacing on variable vineyard development costs.

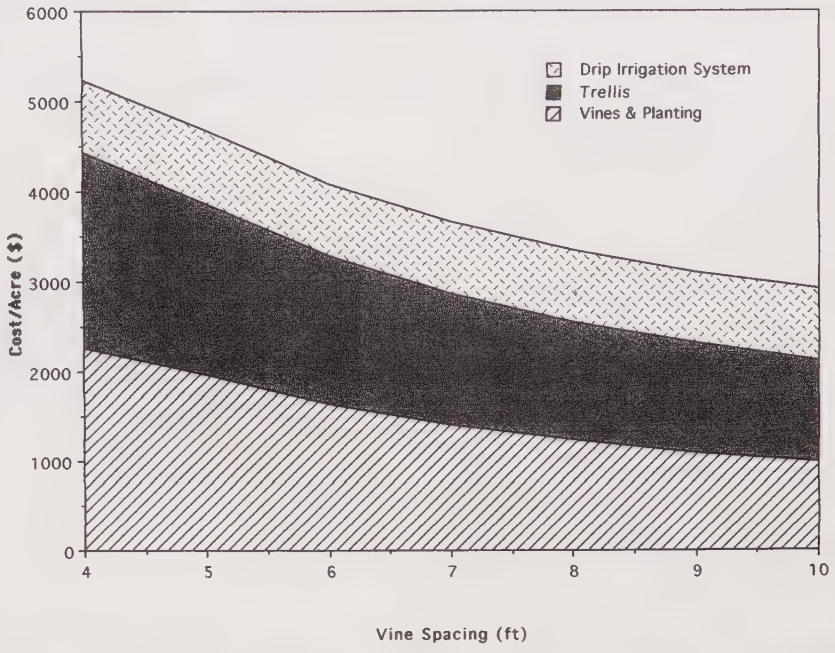

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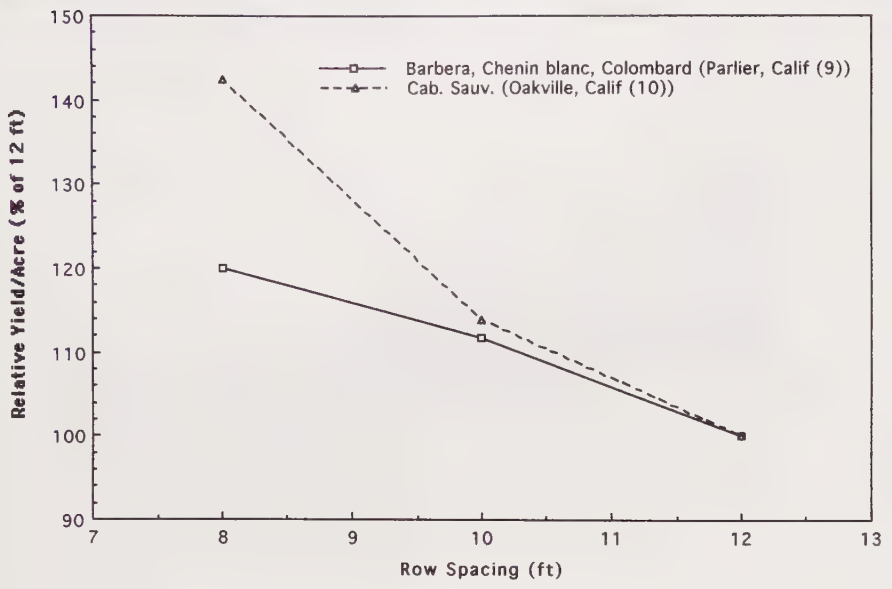
Figure 7— Effect of row spacing on relative grape yield.



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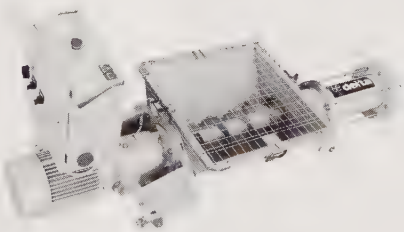

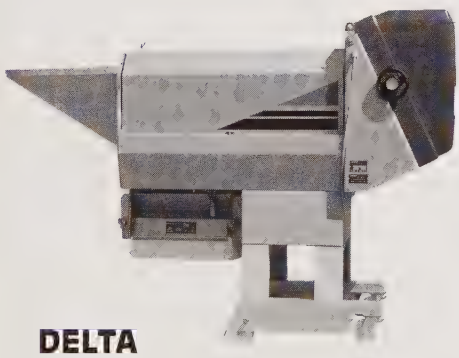

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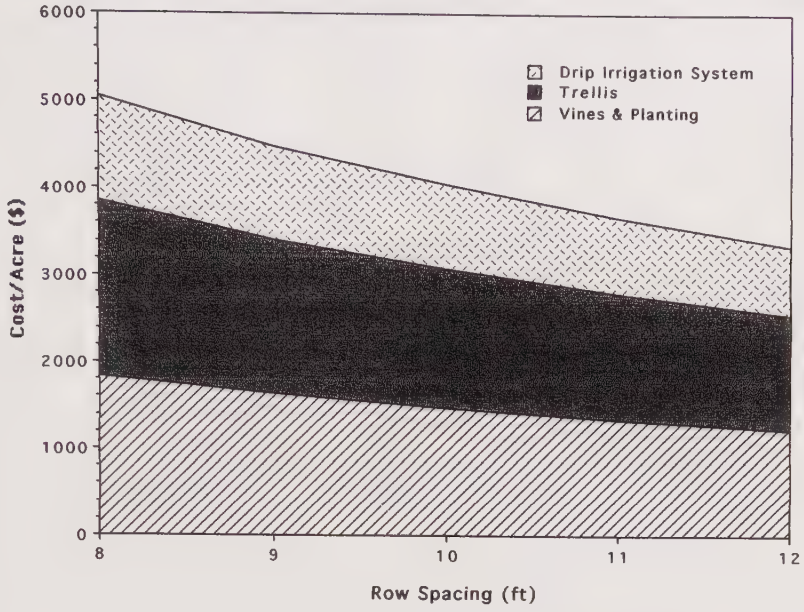
Figure 8 — Effect of row spacing on variable vineyard development costs.



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MOUNT VEEDER VITICULTURAL AREA

CABERNET WITH ALTITUDE

BY Eleanor & Ray Heald
Contributing editors

At the southern end of the Mayacamas Mountains, west of the city of Yountville, Mount Veeder rises 2,500 feet above the western side of the Napa Valley floor. Grape acreage elevation in the Mount Veeder AVA ranges from 400 to 2,400 feet. Vineyards dotting the steep hillsides produce Cabernet Sauvignon with altitude.

High above the fog bank, the microclimate is very different from the valley floor. Vineyards receive gentle morning sun. Cooling mountain breezes offer refuge from intense afternoon heat. Nights are cold.

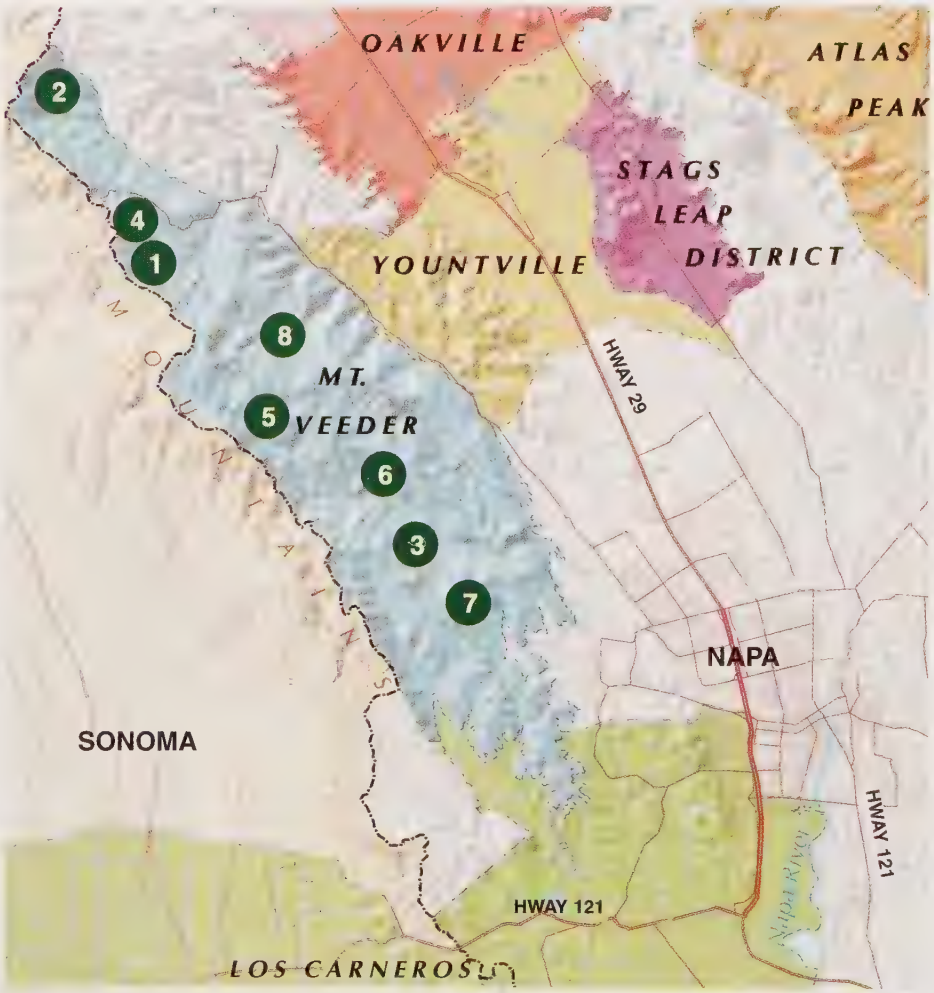
Twice as much rain falls on these Mount Veeder vineyards as on those in the valley. Wetter, cooler winters translate to later bud break, and harvest is generally two to three weeks later than in valley vineyards.

Mount Veeder vineyards have multiple, shallow, fractured soil types, principally decomposed volcanic rock, clay, gravely loam, and shale. Despite popular expectations of mountain vineyards, some sites are considered vigorous.

Independent of soil type, steep rocky slopes provide good drainage. Vines yield grape bunches with highly-concentrated small berries and intense varietal character.

Mountain viticulture is demanding and costly. However, when farming challenges are successfully met, distinctive wines with singular character can result.

Winemakers interviewed by *PWV* for this appellation-focused varietal review discuss their goals of preserving the integrity of the land in the Mount Veeder AVA and fostering naturally-balanced vines that produce wines of *terroir*.



MAP COURTESY OF **VESTRA RESOURCES**

What's in an appellation?

Lokoya Winery makes Cabernet Sauvignon from several different sub-appellations of the Napa Valley. Winemaker Marco DiGiulio, therefore, has the ideal perspective to compare and contrast Mount Veeder fruit quality with that of other Napa Valley high-elevation sites such as Diamond Mountain and Howell Mountain.

He suggests that discussion of Napa Valley Cabernet Sauvignon is too generic. Climate and soil differences within the valley create many different wines. However, of all wines he works with, DiGiulio declares Mount Veeder Cabernet Sauvignon is by far the most powerful and intensely structured.

"In many respects, Mount Veeder is the pinnacle of Cabernet in the Napa Valley," he contends. "It is the one where the volume is turned up the highest — more tannin, acid, structure, color, and fruit — it's got it all. The trick to making good Mount Veeder Cab is controlling magnitude, moderating the volume down so the wine's not over the top."

Randle Johnson (The Hess Collection)

stresses that putting a finger on the exact elements that make Mount Veeder Cabernet different is difficult. "There are multiple exposures, different elevations, many soil types, a number of different winemaking styles, and different oak regimes impacting a wine that's ultimately bottled as Mount Veeder," he emphasizes.

"All that being said, I agree with Marco [DiGiulio]. These wines are intense and can be very tannic. Today's winemaking goal, however, is not the bigger the better. That was the 1970s model, and consumers no longer want enamel-stripping Cabernets. New century Cabernet Sauvignon winemaking goals are to retain fruit and go easy on the tannin."

Wine style

While some producers suggest that Mount Veeder Cabernet Sauvignon is designed for collectors, Robert Craig (Robert Craig Wine Cellars) disagrees. "Collectors also want balanced wines without aggressive tannins. They've learned that, in some instances, a tannic young wine can end up to be a tannic old wine with dried-out fruit."

Yet, Tony Sargent (Rubissow Sargent) says, "We're not trying to quench the taste of a nation with Mount Veeder Cabernet. It's a small appellation that is geared to a specific style. There are variations within the style, but the wine separates itself from the rest of Napa Valley, which separates itself from the rest of California."

Dennis Emslie-Drummond (Mayacamas Vineyards) admits that "at consumer tastings, Bob Travers (owner) brings older bottlings because the new-release wines have not developed full complexity."

There's another factor in the drinkability equation. "Like it or not, many opinion leaders view mountain wines as being bigger wines," Johnson contends. "They also love to do retrospective tastings and expect mountain Cabernets to show well 10 years past vintage.

"When we're blending, we have to make powerful wines for brand building. Even though the wines tasted in a retrospective are no longer available in the marketplace, consumers use the ratings to judge whether or not a brand is ageworthy."

Craig adds, "Producers should make the style of wine they want. Yet, if I have a wine that I can't drink for 10 years, I think I'm missing elements only enjoyed in youth. I call this the pretty baby theory of wine."

All this being said, Bill Jenkins (Wing Canyon Vineyard) sums up stylistic goals for a Mount Veeder-style Cabernet Sauvignon: concentration of ripe fruit, balance, length, and ripe tannins without bitterness or astringency.

Control is key

If the wine quality envelope is being pushed, what must be done differently on Mount Veeder to manage aggressively intense mountain fruit?

"Control is the key word," David Perata (Mount Veeder Winery) maintains. "That starts with regulating growth early in the season, so leaves can be kept on the vine late in the season." Perata targets cropping at four tons per acre (TPA). Because of different terrace widths running with the contours of the hill and encountered swales, vine size varies widely.

"Clay soils on Mount Veeder hold significant moisture, and there's a lot of growth early," Perata continues. "Then later in the season, the vine does not have resources to support that growth because soils are low nutrient, low fertility, and water depleted. Unlike the valley floor, Mount Veeder has poor water resources late in the growing season."

At 800 to 900-foot elevation on Mount Veeder, soils are uplifted sedimentary clays with significant shale base. There is not as much volcanic-origin soil. At 1,000 to 1,200 feet, soils are volcanic with a lot of rock. "There are, however, some sites at 1,200 feet with sedimentary clays like Jade Mountain's Paras Vineyard," notes Johnson.

In the uplifted sedimentary clays, there are 36 to 60 inches of pure shale. Rubissow Sargent vineyards are in this category.

Rootstocks are the first level of control. For example, 110-R is good on hillside slopes, but low-vigor rootstocks, such as 420-A, 3309C, and 101-14 (regarded as medium vigor), keep vines small. Perata has used 1103P and 5C for Cabernet Sauvignon but prefers lower vigor stocks. Vertical training without a big, divided canopy is best. Some high vigor sites do require low vigor stocks, though, notes Johnson.

There are many vines planted decades ago on St. George rootstock; most wineries are content to retain them until age forces replanting.

Mount Veeder soils are acidic with a high magnesium ion (Mg^{++}) content, which leads to the larger problem of potassium ion (K^{+}) uptake. A proper magnesium ion-potassium ion ratio is inhibited by clay soils, so calcium ion (Ca^{++}) is added to adjust this. "At Hess Collection, we have high K^{+} soils and low Mg. We do add Ca^{++} to help all nutrient balance and to adjust pH," notes Johnson.

For newer plantings on a unilateral cordon, Perata recommends four-foot spacing

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Napa, CA

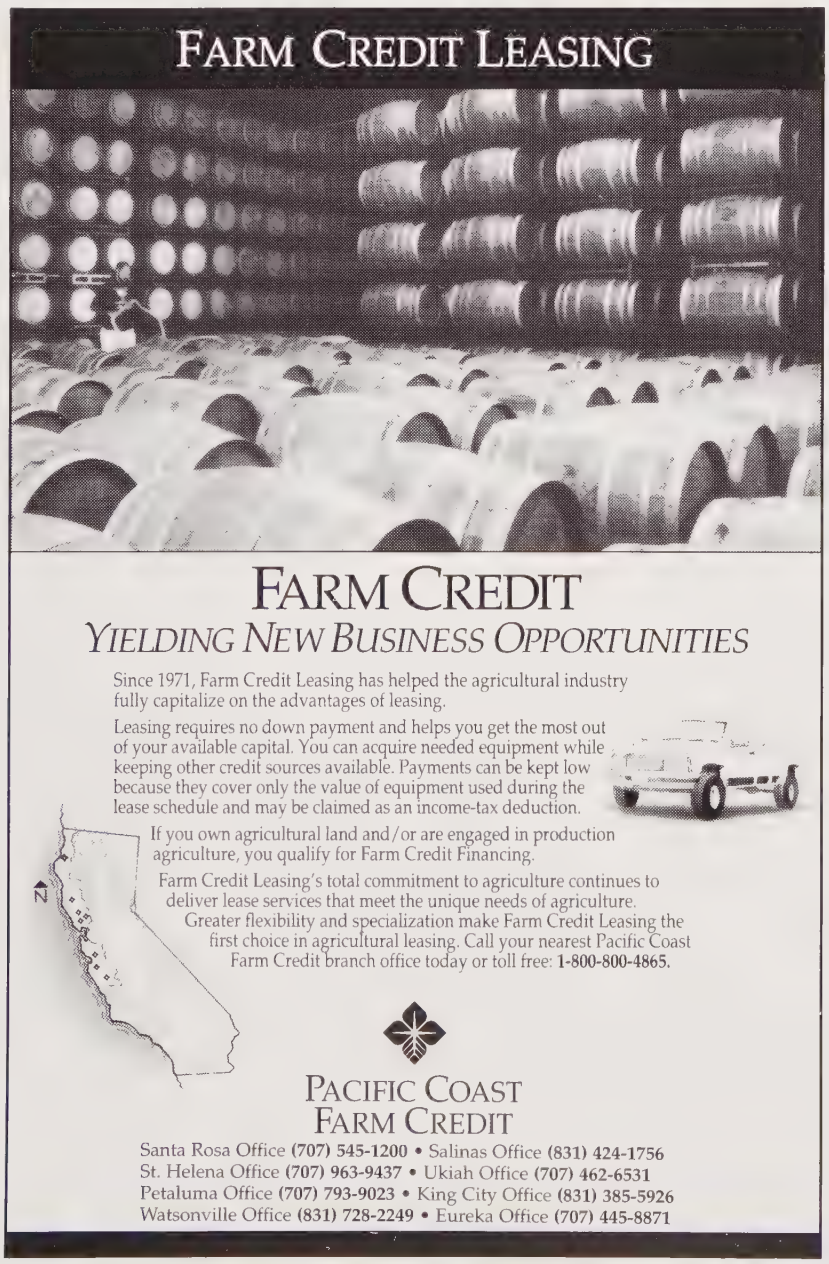
Map markers indicate vineyard locations

between vines. For anything wider, he recommends bilateral cordon which creates greater uniformity throughout the length of the cordon.

"It takes one to two years longer on Mount Veeder than in the valley to have vines fill the wire," he notes. "We've chosen a taller trellis (6.5 feet instead of the normal 6-feet) to promote a larger leaf area to ensure ripening late season. Due to terrain, vines are not mechanically hedged, but if needed, the process is done manually."

Johnson suggests that, ideally, he prefers shoot growth to a maximum of 30 to 36 inches. Best is if internodes shrink with complete shoot length, post-veraison (in August), at 36 inches. "This is difficult to achieve," he reports. "We've used a number of different trellis systems to try to attain it.

"We view trimming and hedging as remedial. Therefore, we've paid a lot of attention to rootstock. We're finding that, in some of our blocks, we have vigorous soils. The concept of mountain soils always being low vigor is untrue. A few spots are pure rock, and vines in pure volcanic ash don't do well, but if you mix a little bit of soil with lots of rocks, roots will go down."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Planting generations

Three planting generations on Mount Veeder can be characterized. In the 1970s, St. George rootstock was principally planted because mountain vineyards were thought to be drier, lower-vigor sites.

In the late 1970s and early 1980s, after it was discovered that, in fact, St. George produced an overly-vigorous vine on most Mount Veeder sites, the second generation plantings were on AXR-1.

Since the onset of phylloxera in the late 1980s, a third, and current, generation of planting uses new rootstocks with tighter spacing and new row orientations. Between tighter spacing and requirements of the Napa Valley hillside ordinance, most growers have shifted from terracing to planting up and down with the hill.

Tighter spacing has made better use of acreage. Smaller vines can be grown, with less fruit per vine, but more vines per acre.

Currently, only two of the new French clones (15 and 337) of Cabernet Sauvignon have been planted. But growers have also chosen Clone 4, which is gaining popularity. Some plantings have been made with Clone 6 and Clone 5197 (both Beaulieu Vineyard selections). At Lokoya, new plantings are clones 337 and 4 on 3309 and 101-14."

"The challenges of phylloxera brought vineyards to the forefront, where they should have been," Marketta Fourmeaux (Chateau Potelle) adds. "Vineyards, even in the early 1980s, lacked the primary importance they have now."

Most of Chateau Potelle's dry-farmed vineyards, planted in 1973, remain on St. George and are satisfactory. In 1999, a newly acquired parcel was planted with a broad selection of rootstocks and clonal selections.

Jenkins also dry farms and practices sustainable viticulture.

Controlling tannins

Perata suggests that, in the vineyard, controlling tannins goes back to bal-

ance. "What we try to avoid is having to pick because there are no more leaves; if we do, then we've missed the balance," he reports. "At harvest, we like to see basal leaves yellowing a little, not turning crisp and dry and losing the canopy. At optimum grape maturity, a vine should not be done, but just slowing down."

In irrigated vineyards, and depending on the weather, Perata gives vines water up to one week before harvest. But the amount of water is tapered off over several weeks. Judgments on timing are based both on vine appearance and flavor taste analysis.

Larry Levin (Mount Veeder Winery/ Franciscan Estates) explains his interaction between vineyard and winery on the issue of tannin management. Near optimum time of picking, a grape sampler goes out on a set route through the vineyard. Levin samples a day behind. Depending on sampling and lab results, Levin decides which blocks should be picked on specific days. "Lab numbers are a guideline, but taste is the most important factor," he stresses.

"Picking decisions are based on taste more than anything else. I think tasting grapes is misunderstood by many people. I've seen winemakers taste the juice and spit it out, but the taste of red grapes is almost entirely in chewing up the skins. Seeds also need to be judged, as clues to maturity.

"No descriptors perfectly describe what I'm trying to do. You can't train someone to do this overnight. It's practice until you have enough experience. When grapes are at optimum maturity and skins are chewed, tannins don't taste green. The flavors are jammy, and the tannins are less green and smoother. It's analogous to what tannins do in the fermentor."

Levin believes in extracting whatever can be extracted in the fermentor and notes that concentrated tannin is not bad because it gives wine a better mouthfeel and aids in the finish. However, he says, harsh tannins are bad. If the maximum amount of tannins are extracted from the grapes, they can be softened in the fermentor with extended maceration.

"Personally, and this is where we may disagree," he continues, "pressing early is not the best way to go with Cabernet Sauvignon. At time of pressing, the volume of extraction is stopped and more often than not, harsh tannins are in that volume in larger amounts than if pressing is delayed.

"During the extended maceration, wine needs to be tasted nearly every day. Through taste, it is possible to notice when tannins start to soften. There's a gripping, drying, astringent tannin character that disappears during extended maceration (three to four weeks total time on skins) before press-

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ing. Tannin does not have to taste bad. As tannins evolve during maceration, they go from harsh, bitter, and astringent to rich and smooth. Good tannins aren't coarse, they give the impression of a rich finish."

DiGiulio is in the extended maceration camp with total skin contact time of 30 to 40 days, as is Sargent at 18 to 26 days.

Jenkins punches down the cap about three times daily during a six to 10-day fermentation. He presses immediately (using a Zambelli basket press) and goes direct to barrel.

Other opinions

Craig believes that, for a long time, tasting grapes was little more than a romantic notion, but today tasting is critical, not only skins, but seeds. As a source of tannins, seeds can indicate when fruit is ripe. They convert from a green astringency to a nutmeg flavor, he says. This makes sense since the ultimate function of fruit is to ripen seeds. "Differentiation from vineyard to vineyard in the resultant wine can only be expressed when grapes are fully ripe," he adds.

"In earlier years, we did extended maceration trials and then moved away from it because we believed it resulted in harsher tannins," Johnson indicates. "Over the last three years, we returned to trial mode with extended maceration, using three to four of our total of 16 open-top fermentors for the last lots picked.

"We've also tried the same lot of grapes with and without extended maceration, but this is difficult. Our open-top tanks are eight-ton minimum, so we need 16 tons of fruit from one block. We only have two blocks on the entire ranch that will yield 16 tons."

Johnson employs pre-maceration fermentation for about two days and maintains that it ties in nicely with uninoculated fermentation. However, trials are also being done with inoculated (after three days cold soak) compared to uninoculated fermentations.

More tannin management

Craig believes that tannins can be managed in the winery. He explains that his cellar regime begins with a one-day cold soak. To drive up fruit character, a large percentage of whole berries is used.

As equipment allows, Craig punches the cap down or pumps over as many as 12 to 14 times per day during the first two to three days of fermentation (peak juice temperature of 70° to 75°F).

As fermentation continues, there's more maceration as alcohol extracts tannins from skins and seeds. Once maximum color and flavor depth are reached, pressing is done, before dryness and before gritty tannins are perceived in the taste. Fermentation completes in barrel and accelerates early integration of fruit and oak.

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Craig maintains that his experience with extended maceration post-alcoholic fermentation has not been good. "With extended maceration, the fruit is not as prominent," he explains. "I believe that when wine is in contact with skins for a number of weeks, it loses its bright fruitiness."

Fourmeaux conducts a long maceration up to 33 days past dryness. She explains that tasting judgments predict time of pressing. "Early on, the wine goes through a harsh phase which I describe as ugly. It then passes into a bitter phase, and in a matter of 24 hours, the wine turns pleasant and we press that day."

Cap management

Craig, DiGiulio, Levin, Jenkins, and Johnson use open-top fermentors. Johnson believes that, with powerful fruit and peak maturity, blowing off a little alcohol is a good idea.

Fourmeaux uses closed-top tanks and says it's more a result of logistics than for any other reason. Sargent also ferments using closed-top 6,000-gallon tanks and some half-ton bins. The cap is sprinkled twice daily for 30 minutes.

Levin's cap management is punchdown for some smaller tanks and pumpover for larger ones. He says there's no set recipe. "Early in the fermentation, we don't do anything until we actually get a cap," he adds. "I know a lot of wineries have a set regime of a given number of minutes so many times per day, but I don't believe in that.

"There's a period where there's no cap. The cap builds, gets hard and dry early, then it gets softer. We punch down lightly and hardly at all at the beginning and the end. But there's a period in the middle, when the cap is so hard that we do a short pumpover to wet it down before we punch down. When the cap softens, it's easier to punch down. We work the cap for a time and when it's punched down, it's done.

"During extended maceration, the cap is punched down about once each day, just to wet it. If we get nervous about the soundness of the cap between pumpovers, we cover and shrink-wrap the tops to seal them and gas the headspace. It gets a little harder on the nerves each day, because the caps can develop volatile acidity easily."

DiGiulio notes that he does not touch the cap during extended maceration. With CO_2 running in nearly all the time, open-top tanks are sealed for the duration.

Fourmeaux makes decisions based on smelling the cap. When there's sufficient CO_2, nothing is done. After CO_2 decreases, when it's deemed necessary, the cap is punched down gently (closed-top tanks are small with sufficient headspace). "I agree with Larry [Levin], there is no recipe for punchdowns."

Craig suggests that the decision to pumpover rather than punch down is a matter of the amount of O_2 a wine-

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maker likes to have in contact with red wine.

"I prefer pumping over, but not because of O_2," DiGiulio maintains. "I just think pumping over is gentler than punching down. I don't believe one gets more O_2 with pumpovers. Use an O_2 meter and measure it.

"Yes, you're exposing the wine to air, but it's totally protected by the CO_2 in the juice and the CO_2 that builds inside the sump. There's no O_2 in the sump. You might *want* to aerate via pumpovers, but you're not getting it, unless you use special methods."

Alcohol levels and MLF

Emslie-Drummond says that alcohol levels for Mayacamas Cabernet Sauvignon level off between 12% and 13%, while other varietals grown on Mount Veeder go higher. "We are more interested in slower developing wines, with plenty of acid and tannins, rather than a quick ageing wine."

"We're getting higher alcohols, in the 14% neighborhood," Johnson admits. "I stop grape sample analysis when sugars hit 23.7° to 24° Brix. Then we go completely on taste (juice and chewing skins and seeds).

"By the time grapes get to the winery, they are 24.5° or 25° Brix. Alcohols then end up being 13.9% to 14.5%. It has been said that these alcohol levels are due to better yeast conversions, but uninoculated fermentations don't lag far behind in efficiency.

"Where did we ever get this conversion of 0.55 x sugar equals the alcohol?" asks Johnson.

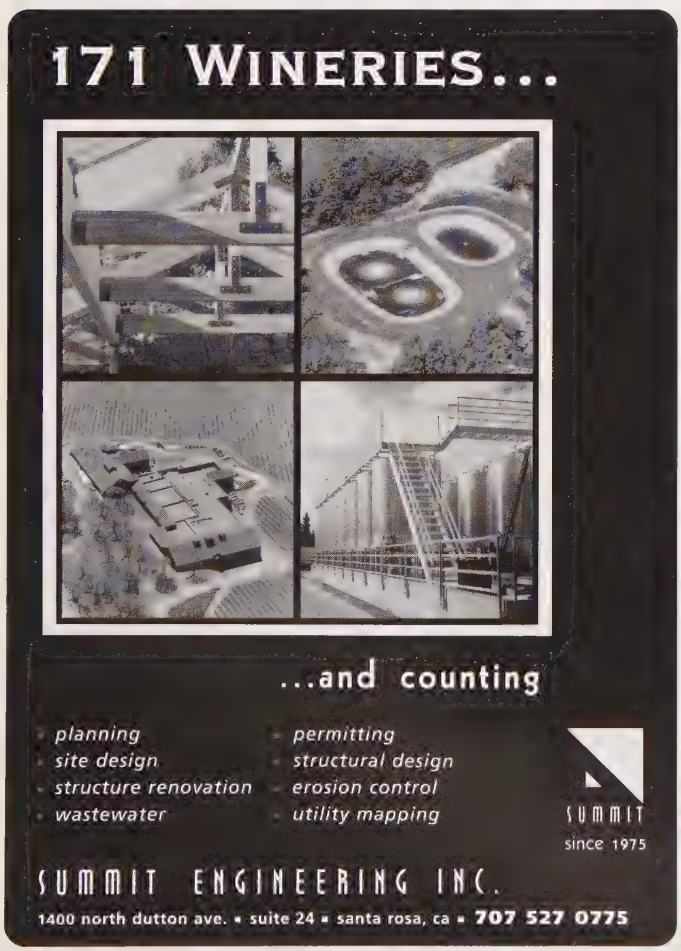
Winemakers agree with Levin when he says, "We just try to get malolactic fermentation (MLF) finished, but chances are that happens in the barrel. My philosophy is: red wines to barrel young and dirty. This can be within days of fermentation."

Time in barrel and rackings

Surveying participants reveals the following time in barrel: Chateau Potelle, 18 to 24 months with 75% to 85% new French oak; Craig, 18 to 20 months with 50% to 60% new (90% French, 10% American); Hess, 20 to 24 months, 50% new and one-fill French tight-grain oak; and Lokoya, 18 to 24 months, 80% to 100% new French chateau barrels.

At Mayacamas, the regime is 1.5 years in tank followed by one year in barrel, 10% new. Mount Veeder is 18 months on average, French oak 30% to 50% new; Rubissow Sargent is 12 to 18 months, French oak, 30% new to eight years old. Wing Canyon is more than two years, half new French oak chateau barrels. Mount Veeder Reserve is all French oak; a mixture of French and American for the Cabernet Sauvignon, 30% to 50% new.

Levin explains that rackings are done



anywhere from three to six months apart and timing depends on taste. Whether that's aerative racking or not, also depends on taste. For heavy, extracted wine that's tight and needs opening up, racking is either aerative or more frequent. He notes that time in barrel is also taste-dependent, but fairly consistent at 18 months.

DiGiulio does non-aerative rackings every nine to 12 months; only twice during the barrel regime.

Hess Collection racks quarterly in the first year and twice in the second year. "We don't make a point of splashing during racking," Johnson explains. "Between hoses, tank, and transferring back to barrel, racking is partially aerative, so there's no need to deliberately splash."

The B word

"We've all heard that a little bit of Bret (Brettanomyces) is a complexing element," Johnson contends. "But it's very hard to get just a little bit. If bottling is unfiltered, you better not have Bret in the wine."

"If you do, every bottle is going to be different," Levin adds. "If you're putting something in the bottle that's alive, and Bret is present, some populations will grow and others won't. There's so much we don't know about Bret, particularly its nutrition. So, it's difficult to analyze a wine at bottling and know the chances for Bret growth.

"With yeast and ML bacteria, analyses are possible and odds can be weighed about continued growth. When you bring Bret into the picture, you may be playing with fire.

"However, two years ago, I never thought I'd say this. When I taste a superbly great, rich bottle of wine, Bret is not as big an issue. It may be one of the minor components of the wine. In a complex, rich, older wine, chances are people won't notice it. But if any one of those qualities is predominant, it can stick out like a sore thumb.

"Would I try to encourage Bret in a wine? No.

"The good thing about Bret is that it's sensitive to SO_2. There's a period following fermentation in a young wine, while it's going through MLF, when it's difficult to control.

"If you want to maintain SO_2 levels and control Bret, perhaps there's a little bit of Bret character while MLF is finishing and then it's stopped. In those cases, you may be able to have a little bit of Bret.

"But if free SO_2 drops during ageing, which it will, then it may come out in the bottle. Like I said, it's risky.

"Some wineries encourage Bret. They do plate counts and watch it go through bloom and then say 'It's done its thing, no worries,' but it can bloom twice. Unlike other yeasts,

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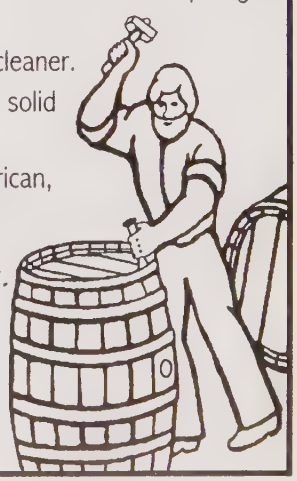

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Bret eats more than sugar."

Sargent notes, "There are people who like Bret and those who don't, but I can't make separate bottlings to match preferences. It's not worth the risk to have any."

Blending varietals

By and large, Mount Veeder vineyards are on an east-facing ridge with a number of southern exposures. There are few west-facing vineyard sites. The biggest challenge to growing Cabernet Sauvignon on Mount Veeder is the exposure due to multiple slope directions. "You can't change that," Perata emphasizes.

"It's the site, the *terroir*," adds Johnson. "It might not be exposure alone. It can be the particular soil that a block has within a given exposure."

The second greatest challenge is picking in particular blocks for uniform maturity.

"You do need to select varietal by exposure," Craig adds. "In warmer blocks with significant day-long sun (south, southwest exposure), Cabernet Franc, a late ripener by nature, does well. Putting Merlot in the colder sites and Cabernet Sauvignon somewhere in between is a good plan."

"Independent of how each of us makes wine, we have these specific growing exposures in common," says Fourmeaux. "Mount Veeder Cabernet Sauvignon is more focused (in flavors and structure) compared to the valley floor, which is a broader-based wine."

With Cabernet Sauvignon, Merlot, and Cabernet Franc planted from the early years, Hess has recently planted Malbec and Petit Verdot. A single block of Cabernet Franc is planted on a flat spot with southwestern exposure. Petit Verdot, also a late ripener, is planted in a warmer block.

Perata suggests that planting of Bordeaux varietals other than Cabernet Sauvignon is still in the diaper era on Mount Veeder. Any predictions of the effects of exposure on these varietals are premature.

"From what I've seen so far, Cabernet Franc is not the strongest part of our blend," Levin maintains. "Merlot and Cabernet Sauvignon get very intense. Merlot (at about 25%) contributes lush fruit and texture."

Emslie-Drummond is encouraged by Merlot's color depth and acid balance at Mayacamas.

Craig notes that blending percentages vary significantly vintage to vintage. For Merlot that can be 3% to 8% and for Cabernet Franc 1% to 4%. "A little Cabernet Franc helps the aromatics," he suggests. "It also adds some interesting flavors."

Hess includes Cabernet Franc at no higher than 3%. Merlot is 5% to 9%, and Cabernet Sauvignon is a minimum of 90%. "This may change when Malbec and Petit Verdot are available," Johnson explains.

Although it can vary, Jenkins blends with about 10% each of Merlot and Cabernet Franc. He believes these two varietals increase complexity and offer more generous mouthfeel and flavor synergy.

"Hopefully, the California wine industry has matured enough to understand why five varietals are planted in Bordeaux," DiGiulio says. "A lot has to do with the realities of the climate, and in some years, some varieties are better than others. It's an insurance policy.

"Ultimately, we're all trying to make the best Cabernet Sauvignon from Mount Veeder that we can. If that means adding a little Cabernet Franc for aromatics or Merlot to soften the Cabernet Sauvignon — that's great. Each of us has our own idea of the ideal expression of Mount Veeder Cabernet Sauvignon.

"As years go by, I'm becoming more convinced that if you can grow really great Cabernet Sauvignon and you've got a good vintage to work with, then you don't need a whole lot else for a great wine," concludes DiGuilio.

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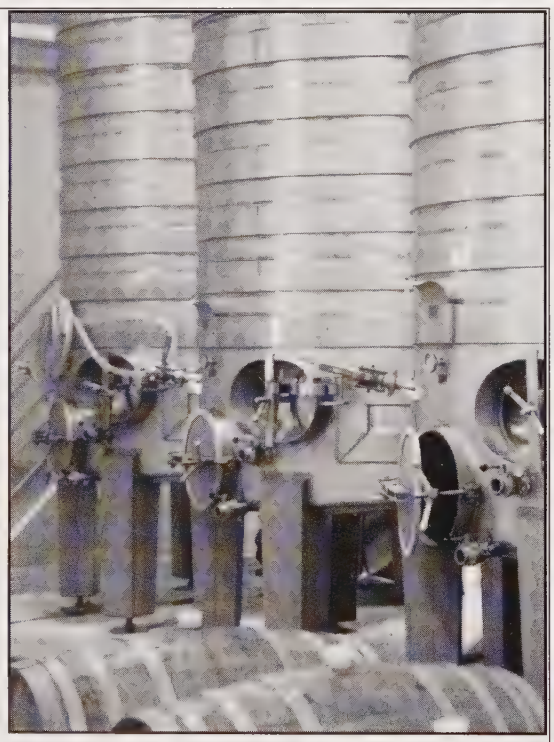

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IN THE VINEYARD

LOOKING AHEAD

BY Millie Howie

What significant changes have vineyard managers seen in the past decade and what do they believe the future holds? With the 1990s passing into history and the year 2000 approaching, ***PWV*** asked prominent vineyardists from five U.S. states their opinions.

Many of the changes they note were spurred by phylloxera invasions that forced growers to remove thousands of acres of vines. They acknowledge that this disaster opened the door to opportunity as growers revised their thinking about sites, rootstock, clones, spacing, trellising, and irrigation.

CALIFORNIA
Lodi region

John Ledbetter, partner
Vino Farms, Inc. (Lodi, CA)

"Several important changes have taken place over the past decade. One of the biggest has been the increase of interest in sustainable agriculture and Integrated Pest Management (IPM), which help reduce our dependence on chemicals. Another positive change has been the introduction of new equipment and technology for low-volume application of sprays, particularly herbicides. The impact of these changes will be felt as the Food Quality Protection Act is more generally enforced, and they will help us to continue to farm and grow quality products.

"As devastating as phylloxera was, it made us take a hard look at what we were growing and where we were growing it. We now do a much better job of matching soil, irrigation, climate, and light exposure needs and have learned what varieties to plant where.

"Wineries and growers now have a better understanding that quality is what drives the ship, and working together, we can make sure we all make a profit. With the global market and increasing competition from southern France and the New World wines that are coming in from Australia and Chile, we have to recognize that one huge, huge issue will be understanding and utilizing strong marketing and public relations. The Wine Marketing Council needs our help, in U.S. markets and abroad, to build an arsenal of facts supporting the value of the industry's quality products.

"I think we're doing a better job of educating our local, state, and federal legislators about the needs of the industry. On every government level, the leaders need to realize how important our industry is. Wine grapes are the sixth largest agricultural commodity in the country, and when you add the value of the finished wine, we represent a major force in the U.S. economy. It is essential that we receive our fair share of research dollars from state and federal sources.

"We have to build some strong relationships with non-traditional groups, such as environmentalists, and work together on issues, such as water and preservation of agricultural land, and that isn't going to be easy."

CALIFORNIA
Monterey region

Steve McIntyre
Monterey Pacific (Monterey, CA)

"In the 1990s, improvements and changes in the industry included gathering a body of evidence about the effects of sunlight on wine quality and grapevine physiology. Higher vine density through closer spacing has resulted in a change to new and better trellis systems, and the proliferation of new clones has improved plant material.

"My predictions for the future include the feeling that consolidation of winery/vineyard operations will continue, and major vineyard operations will do more of the actual processing, including crushing, pressing, and fermentation. Viticulture and enology will be taught as one subject at the university, and driverless tractors will be perfected."

Doug Meador, winegrower
Ventana Vineyards
(Monterey, CA)

"If one looks back at the wine industry, the historical pattern has essentially been one of division between the growers and the winemakers. In the past 10 years, there has been a healing of that division, and the recognition that the grapegrower plays an important part in the creation of quality wine.

"The radical change in vineyard design has also had a tremendous effect on the quality of the fruit and thus on the wine quality. Ventana has basically been an experimental vineyard. In the 1970s, we developed and installed a new trellis system, engaged in shoot positioning, and introduced the vertical canopy system. You would have thought we had committed a social blunder. In the last six years, we have seen a radical conversion to those techniques. Some of our practices, such as basal leaf stripping, are now written into most grower contracts.

"Now that the floodgates are open and there is an understanding and acceptance of growers as an integral part of the equation, I think we'll see greater and greater strides forward in fruit quality."

Rick Boyer
Jekel Vineyards
(Greenfield, CA)

"Trellis design for providing proper light exposure and consistent physiological ripeness has to be one of the major factors influencing grape quality in the past 10 years. We have also made great strides in collecting and analyzing weather data, which coupled with improved drip and micro-sprinkler irrigation, have improved the accuracy of

water application and vaulted us forward dramatically in terms of fruit quality.

"In the future, I think a prime element in successful growing will be matching rootstock with clones. As our industry focuses on higher quality, site-specific viticulture will become the norm. We are seeing pertinent research conducted on local levels in many areas leading to sustainable agriculture. As the larger growers adopt these farming practices, smaller growers — who cannot engage in some of the controlled tests — will benefit from the information gathered. Specifically, we are farming organically and exploring biodynamic practices. As more and more research goes into this area, we will see improved yields and health in California vineyards.

"In our particular area, wind can create serious problems. Systems are being developed to protect the vines from wind damage and to add warmth to the environment around the vine. In this region, vines planted perpendicular to the wind tend to have bigger leaves with an even texture on the south side of the vine. Leaves on the north side are smaller, ragged, and waffled-looking. In a year like 1999, vineyards that had wind protection were eight to 10 days ahead of the rest.

"Most growers use rows of trees. The downside of using trees as windbreaks is that there can be root intrusion into the vineyard, excessive shading, bird habitat, potential damage from frost where trees hold the temperature down, plus extra labor to maintain the windbreak. There are some man-made systems, which will last 20 to 30 years and require less annual maintenance, that are just now coming to the U.S. I think you will see much more energy go into this area as well as into the site-specific nature of our business."

Dana Merrill
Mesa Vineyard Management
(King City, CA)

"The 1990s saw a steady increase in the use of technology for agriculture. Virtually every operation now incorporates computer technology. Electrostatic sprayers are becoming more prevalent in the vineyard industry. Spacing has changed. Where 10x12 spacing was the norm in the 1970s, now 6x8 spacing is more common. Concerns about pesticides have driven IPM, and mechanical harvesting will become more common, even in premium coastal locations, before 2005.

"In the 1990s, the winemaker and grapegrower began to work more closely together. The winemaker now routinely travels into the vineyard, and the grower tastes the resulting wine, which is quite often kept separate either by block or grower or both.

"Labor shortages are beginning to

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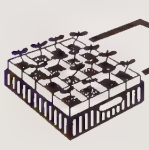
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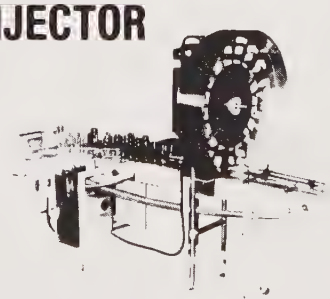
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Inert gas is injected into your bottles after they are air cleaned. "Flushed" bottles are then fed directly into the filling machine.
Mounts over your existing conveyor.
Results in time intervals for 750 ml. Wine Bottles

Line Speed	Air Cleaning	Gas Injection
60 bpm	5 sec.	3.3 sec.
90 bpm	3.3 sec.	2.2 sec.

HOW IT OPERATES!
In clockwise rotation, bottles are guided so stainless steel rinse tube enters neck of bottle 2" to 3".
Bottles are air rinsed for 2-45° long segments while inverted. From 10:00 to 2:00.
Inert gas is then injected while bottles are still held up in rinse tubes from 2:30 to 4:30.
Bottles drop away from tube and onto the filling line conveyor.
IMPORTANT FEATURES
- Line space of only 25" to 40" depending upon line speed.
- All stainless steel and plastic construction.
- For Wine Bottles, all 75 ml. bottles can usually be handled on the same rotor.

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loom, and pay rates will likely rise, along with an increase in benefits, including health insurance for those in the lower wage brackets.

"In the future, the complexity of issues and challenges facing agriculture will continue to increase, and environmental concerns will add significant cost and time to vineyard development projects. Federal, state, and county ordinances will become ever more a factor in the years approaching 2005."

CALIFORNIA
Napa County

Richard Camera
Hess Collection Winery
(Napa, CA)

"The verdict is still out on some of the practices we think are the best at this time, such as closer spacing (7x5 and 4x4), new rootstocks and clones, and so on. We won't know how beneficial these things are for at least another five years.

"The equipment for some of these new spacings is much more available and now some is American-made. However, unless the results from very close spacing (4x4) are impressive, this market for special equipment will plunge."

Martin Mochizuki
Walsh Vineyards Management
(Napa, CA)

"In regard to the most significant changes, I would have to say that the use of new rootstocks, clones, and trellis types would have to rank at the top. I would predict that the improvements in the next five years will come about through our learning to utilize these new methods to produce the best possible product."

CALIFORNIA
Sonoma County

Duff Bevill
Bevill Vineyard Management
(Healdsburg, CA)

"The most significant change has been the "new" — actually, old — idea of growing quality in the vineyard. Probably the one big factor has been correctly matching the grape variety to the growing site, followed by the improvement in trellising.

"The first boom in the industry was in the late 1960s and 1970s when many in the Dry Creek Valley planted Pinot Noir and Cabernet Sauvignon. By today's standards, few of the resulting wines were very good. Now we know that Pinot Noir should be planted in a cooler region, like the Russian River Valley. Cabernet Sauvignon, as a general rule, should be on much leaner soils, rather

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than the valley floor.

"In the last 10 years, we have learned to use drip irrigation more accurately to increase grape quality. Previously, a grower would overhead sprinkle a couple of times per year and that was it. With drip irrigation to apply water and neutron probes and pressure bombs as tools to monitor vine stress, we now can apply water as needed right up to harvest

"In the next 10 years labor shortages will be a problem, and that will force the use and continued development of equipment to do many vineyard jobs mechanically, while still reaching for our quality goals.

"New ordinances governing land use will slow expansion of vineyard acreage, particularly on the hillsides. It is going to be tougher to find and farm land in the prime growing areas because of the increasing incompatability between farming and urban residential encroachments.

"Experimental vineyards of Rhône, Italian, and Spanish varietals will be more widely planted, but most of these plantings will be in vineyards owned by wineries. The grower who sells his crop and makes no wine cannot afford the risk involved in planting many acres of an unproven varietal."

John Clendenen
Clendenen Vineyard Management
(Healdsburg, CA)

"In the past 10 years significant changes were brought about due to the decline of AXR1, which pushed us through the door to new rootstock trials, more clonal research, and new breeding. With the Foundation Plant Materials Service (FPMS) in a new facility at University of California, Davis, and new agreements between some nurseries and the traditional grapegrowing nations, many new clones are available. Cutting-edge nursery techniques are rapidly getting these selections into the field.

"The new plantings due to phylloxera, plus new information from research by experts, such as Richard Smart and others, have brought closer spacing and new trellis systems. The switch to lyre and vertical systems has resulted in more balanced vines and a more efficient use of land. Advances in irrigation systems, developed in part in Israel and Australia, have given us better emitters and filter systems.

"Better tractors, with higher horsepower and lower profiles, and improved harvesters are among the changes on the equipment end.

"We have seen greater emphasis on erosion control, concurrent with increased hillside acreage. Cover crops have been selected for vine vigor control, vigor enhancement, and other relationships with vines.

"We have seen more sophisticated information management with the widespread use of computers, from

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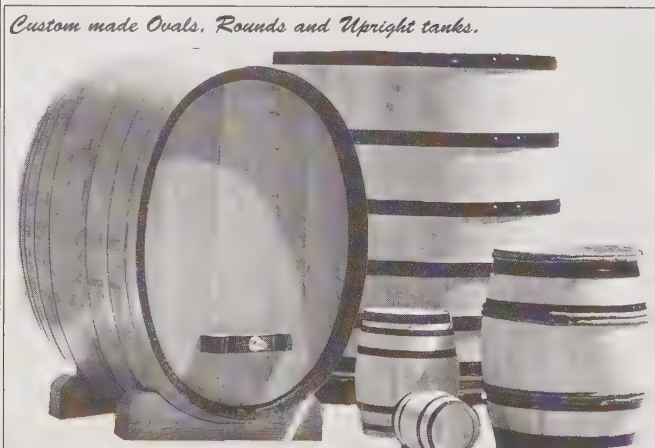

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simple cost spreadsheets to software to analyze weather data and predict the onset of fungal disease. Global Positioning System (GPS) technology and aerial mapping have aided measurably in planting and maintenance of vineyards."

Mark Lingenfelder
Chalk Hill Estate Vineyards & Winery (Healdsburg, CA)

"The most significant development in the 1990s, in a broad sense, has been the concept of site-specific agriculture. The thought now is that variations in the soil in any given parcel demand appropriate variations in vineyard design and installation, including vine density, rootstock, scion, trellis, irrigation, and so on. We used to plant a vineyard uniformly without regard to soil variation. Now we vary the design of the vineyard to achieve maximum uniformity of growth and quality.

"In the future, I think one of the unexplored territories that we need to take a good look at is management of irrigation and its effect on vine growth. I hope to see the use of measurements of vine water status to schedule irrigation in a manner appropriate to growth, yield, and quality goals."

Steve Hill
Sand Hill, LLC/ Durell Vineyards (Sonoma, CA)

"There is no question that the most significant change in the grapegrowing industry has been planting, planting, planting. It has been fueled by phylloxera and by a strong economy that has created an incredible demand for premium varietal wine. New plantings have given us all an exciting opportunity to design new fields with new clones, rootstocks, and trellis systems.

"However, all these new plantings have a potentially negative side. Demand for the grapes may not remain high, and it will be survival of the fittest, or finest. You will have to be the most efficient grapegrower or grow grapes that produce the finest wine. Grapegrowers must be prepared to meet this next challenge with a smaller labor force. There are interesting and exciting times to come."

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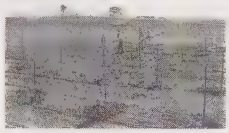

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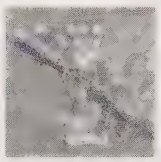
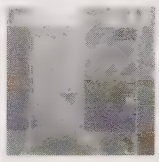
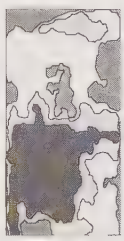
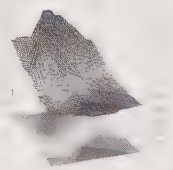






Zone Management from aerial images or EC mapping

Where to sample or test
Site-Selective applications and field management
Directed Pruning, Irrigation, Deleafing, and Harvest
Yield trend estimates
Prescriptions for success, including variable rates



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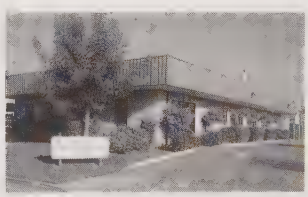

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Anne Moller-Racke
Buena Vista Carneros
(Sonoma, CA)

"What I think has been so revolutionary over the last 10 years has been the advancements in the supply and variety of plant material available. The choice of material we now have is extraordinary. Ten to 15 years ago, we had only five choices of rootstock, now the choices are expanding rapidly; it has been the same with clones. In Europe, growers are delineating even more by specifying a rootstock clone. That is something California growers may be doing in the next decade.

"Questions that will be answered with time are: Is it safe to plant material that has not been certified (spread of viruses)? Which clone is best for the results the winery wants, and where will it grow best?

"With the extensive planting and precision farming taking place in the past decade, an important question to ask is: Will we have the workforce to handle it? Looking toward the future, will we be forced to do more work mechanically? Have we laid out our vineyards accordingly?

"The latter part of the 20th century saw farming practices utilizing many chemical treatments. In the last 10 years, there has been a turn towards organic farming and sustainable agricultural practices. I foresee much greater use and implementation of those philosophies and style of farming practices. Government agencies will probably be enforcing greater restrictions on the agricultural community. An example are the current hillside ordinances."

Daniel Roberts
Kendall-Jackson Vineyards & Winery
(California)

"I am seeing a winegrowing fusion of viticulture and winemaking from site evaluation to harvesting fruit. In the past, if a site was on a mountain and had red soils, we planted it. Now, much more rigor is being applied to evaluating land as to soil and climatology influences on wine quality.

"The introduction of Adcon weather stations allows an almost continual flow of climatic information (solar radiation, minimum and maximum temperatures, rainfall, and wind speed) from field to the office. Using GIS programs, we can correlate data on soils, climate, topography, and wine quality information for improved vineyard development.

"We have excellent information on variety and rootstock interactions with climate and soil. Clonal introductions from France, especially Pinot Noir, have significantly improved wine quality.

"The American Vineyard Foundation is having a significant influence on viticulture and enology research by communicating grower and winery concerns to university researchers.

"I now have the technology that can compile and correlate information on

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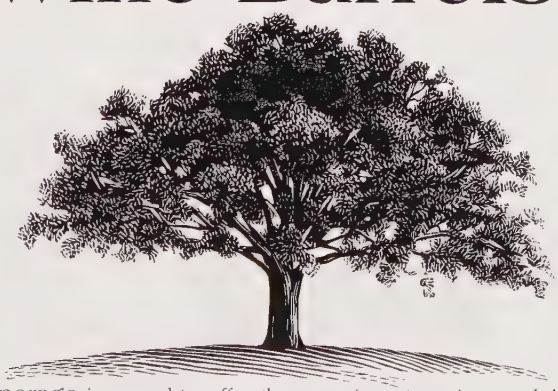

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winegrowing. Ten years ago I dreamed about mapping soil, climate, and winegrowing information. The dream is now a reality."

CALIFORNIA
Paso Robles, south

Dale Hampton
Hampton Farming Co.
(Santa Maria, CA)

"I think two or three important things have occurred in the areas of rootstock trials and clonal selection. We have so many more options now than we have ever had before. New farming techniques and greater attention to trellising and providing light to the vines are other advances. Harvesting machines are getting better and better all the time, and it would be a mistake to turn away from considering mechanization of many routine procedures in the vineyard.

"In the future, I think we are going to see better equipment and more machines that will take our dependence on hand labor out of the vineyard scene. The labor force is dwindling, and we are going to be taking a serious look at how the available work force can be best utilized."

Don Ackerman
Meridian Vineyards
(Paso Robles, Santa Barbara, San Luis Obispo)

"I would say, in general, that the greatest advancements in the past 10 years have been in canopy management — specifically in trellis improvement and technology. Next would be the increased knowledge of rootstock suitability and site selection.

"If I were to make a prediction, it would be that we will see continued improvement and an increased reliance on equipment for mechanical harvesting and vine pruning. Analyzing and matching soil conditions to vineyard technology will be the next area of concentration."

John Crossland
Vineyard Professional Services, Inc.
(Templeton, CA)

"I believe the most important and significant changes regarding the agricultural side of the wine industry in the 1990s are multifaceted. We have become better farmers in our quest to improve quality, improving our position in the evermore competitive world arena of our business.

"Among the significant areas of research of the past decade are canopy management; irrigation technology, both in equipment and theory; a substantial transition to more sustainable farming by lowering chemical inputs through education about integrated pest management (IPM) and utilizing cover crops; improving plant materials; and dramatically improving communications between wineries and growers and with the press."

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Herman Schwartz
Continental Vineyards
(Paso Robles, CA)

"We planted our vineyard in 1973 with wide spacing (7x12) and overhead sprinklers for frost protection and irrigation. As a result of phylloxera, we were forced to retrofit in 1994. We interplanted with new vines on improved clones. We used Freedom rootstock, because nematodes are a problem in our area, and put in drip irrigation, which we can use for fertigation and to control water to the vines to the end of the season. Rather than pull out the three-wire lateral, we converted to a quadrilateral cordon, and now we have a retrofitted and more utilitarian vineyard.

"I wouldn't venture to guess about the future, because I don't think any winemaker has had enough experience with the new clones and rootstocks to determine what works best. I wouldn't even be surprised to find growers pulling out what they now have and trying other clones. I think the jury is still out on the new narrow spacing. Some of the new spacing may not accommodate multi-row sprayers and harvesters.

"We're just going to have to become more mechanized, because there are labor shortages everywhere. If I had to zero in on just one prediction for the future, I would have to say that I see more growers having to turn to machinery for various elements of farming."

CALIFORNIA
Temecula region

Craig Weaver ★
Callaway Vineyards & Winery
(Temecula, CA)

"Probably the first thing that comes to mind is the improvement in FPMS at UCD under Deborah Golino, so that now we are getting clean material, virus and disease-free. This becomes very important when you are paying $3.75 for a bench graft that you put in the ground only to find out that you have problems in the vineyard three years later.

"Second would be the swing to upright trellising. Thanks to the invasion of phylloxera into vineyards planted on AXR1 with old-fashioned trellis systems, a lot of new technology has come into use, and changes in trellis systems have brought easier pruning and easier spraying, allowing growers to be less dependent on hand labor.

"Third would be GIS. We have used GIS for two years in our vineyards, and we know it is really helping farmers see problem areas before they plant, so they know what soil amendments are needed where, or where they should use various rootstocks.

"In the future, GIS is going to be used even more. The way I see it, eventually, we'll be able to have a GIS computer on the tractor, and when we are spraying, we will be able to monitor each vine and supply any minor element the individual vine might need. This will be particularly valuable for vineyards planted on hills, where there can be changes in soil types every 20 or 30 feet.

"To control Pierce's Disease, phylloxera, and nematodes, we are going to have to address gene splicing and genetic plant engineering to develop vines that are less attractive to pests.

"We are going to have to get away from depending on chemicals, because the consumer is demanding chemical-free products from the agricultural community."

WASHINGTON STATE

Michael Sauer ★
Red Willow Vineyards
(Wapato, WA)

"The most significant developments I have seen in Washington state vineyards have been the dramatic changes in trellising systems and the continued expansion of new grape varieties: Syrah, Viognier, Sangiovese, and Pinot Gris. Concerning cultural practice in the vineyard, the use of spray models for

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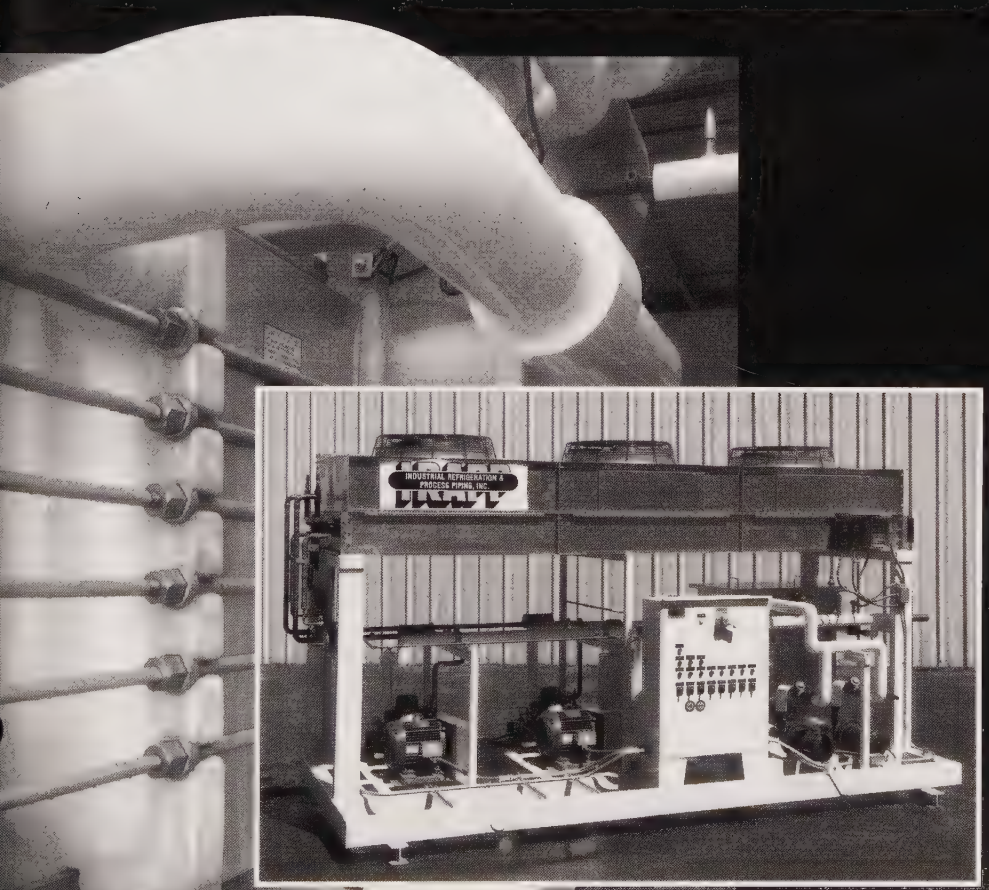

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mildew control and improvements in new generation chemicals available have greatly simplified the battle against mildew and insects. We are increasingly using soil moisture monitoring equipment to manage irrigation and thus control vine vigor. The 1990s have been a golden age of viticulture in Washington state.

"In the next several years, I think we will see Washington state growers identifying and using better clones. We will discover more premium growing regions within the state and start matching specific varieties to those regions. Since eastern Washington is a desert and must rely on irrigation, I think water issues will be at the center of Washington state viticulture."

Wade Wolfe
The Hogue Cellars
(Prosser, WA)

"In Washington state, the most significant changes I have seen in viticulture have been in irrigation and crop management, with increased emphasis on the use of new technology.

"Irrigation, when managed properly, reduces the need for fungicides to control mildew and rot and reduces the need for corrective canopy management. It improves wine aroma and flavors through better light penetration and improves red wine color and concentration through earlier maturity.

"Aerial and satellite photography; soil and plant moisture monitoring; computer collection and analysis of data about the climate, insects, and diseases, and vine conditions; automation of irrigation; communication through networking and the Internet; and economic analysis will all involve and rely on technology. In the future, these technologies will become indispensable aspects of the grapegrowing industry."

OREGON

Ted Casteel
Bethel Heights Vineyards
(Salem, OR)

"I can only speak for what I have seen here in the Willamette Valley, but I think one thing that has happened is that vineyard management has become more professional. We have moved from being sort of backyard farmers to a cadre of trained professionals who manage large acreage.

"Second, the industry has developed a clear vision of what we do well. Pinot Noir is the main variety in this region, and Pinot Gris is probably the most popular and reliable white grape, although I think Chardonnay will be a top variety here, too.

"Another change has been the growing interest in sustainable agriculture. More Oregon growers are involved in Low Input Viticulture and Enology (LIVE), an Oregon program for sustainable agriculture based on a program that originated in Switzerland and is now widely practiced in New Zealand. One of the goals of this program is to limit the use of off-farm materials and get away from dependence on chemicals.

"One step in this direction is increased bio-diversity. There is more planting of flowering plants in vineyards to attract beneficial insects, for example. We have weather problems at the end of the season, so we cannot divorce ourselves completely from chemical tools, however.

"In the next 10 years, I see a trend toward an interest in subterranean agriculture: an examination of the vineyard floor and what's under it. As vineyards grow older, it is essential to look at vine nutrition.

"Oregon's wine industry will always be small, but right now it is in an expansion phase, which I see accelerating in the next five years, and we are already facing a shortage of trained personnel. We have a great field-worker base, but it's hard to find trained vineyard people. Oregon State University does a lot of viticultural research, but there's not a lot of emphasis on viticultural education. Recently, some of us have helped develop an Associate of Arts program in viticulture at the Chemeketa Junior College, Salem, OR, modeled after the program at Napa Valley College.

Diane Kenworthy
Rex Hill Vineyards
(Newberg, OR)

"Clearly the most significant change has to be the thinking that has gone into replanting of North Coast vineyards in California because of phylloxera. Growers tackled replanting with a better understanding of the need to be site-specific, matching *terroir* with grape variety to reach the quality goals they set for themselves.

"Planting of premium varieties in the Central Valley of California and the enormous expansion of vineyards in the Central Coast region are part of the explosive change.

"I feel we have also gained better tools to manage powdery mildew with new materials that have different modes of action to combat many vineyard problems. We also have improved IPM practices, and growers are developing a more responsible use of pesticides.

"What I see in Oregon is that this state, like many states across the U.S., is not just making wine, but making better wine all the time. The `fringe' states are not impacting wine sales with volume production but with top quality."

MICHIGAN

Charles Edson
Bel Lago Vineyards & Winery
(Cedar, MI)

"For me, it's really a combination of things. For example, we have benefited from research done by people such as Richard Smart in New Zealand and Stan Howell at Michigan State University, in developing canopy management and improved trellis systems, which we have now adapted to our needs. In Michigan with our short growing season, our yields have to be kept lower because we have to worry about accumulating carbohydrates in the fall to carry the vines through the winter. Good site selection and proximity to Lake Michigan, where we normally get enough snowfall to help protect the vines, is important.

"Eight years ago, we began planting new varieties, looking for winter hardiness and disease resistance. We are also evaluating 30 different clones of Pinot Noir, nine Chardonnay, five Pinot Grigio, and six Riesling in our vineyards, looking for suitable new

clonal material.

"One of the changes we have seen in Michigan is the improvement in spraying equipment. I've been working with Gary VanEe and Richard Ledebuhr (agricultural engineers at Michigan State University) to develop and test a prototype sprayer for grapegrowers. This new technology helps reduce the amount of spray material applied by about 40%.

"As to the future, I think the industry as a whole is probably going to do a better job with viticulture in general. We're going to see more people spending more time on balance in the vineyard, with better integrated management programs for maintaining vine vigor, optimal canopies, pest management, and so on. The new clones should also help us produce better wines.

"I also see an interest in hybrids, and as new selections come along that offer such advantages as early ripening, disease resistance, winter hardiness, and quality wines, I think these varieties will find their way into our production systems.

"Our pest management strategies will continue to evolve, due in part to societal and regulatory pressures. I expect softer and more species-specific pesticides will be developed, and we will learn more about biological control and vineyard ecology."

★

OHIO

Gene Sigel , Vineyard Manager
Chalet Debonne Vineyards
(Madison, OH)

"The two largest changes for Finger Lakes, Lake Erie, Ontario, and Michigan vinifera growers were trellising and drainage. Prior to the 1990s, vineyard drainage was sporadically used, primarily to drain low spots or to drain systematically across the field every 30 to 40 feet. In the wet year, 1992, Ontario growers began to notice that, in vineyards tiled every fourth row, the vines in the tiled rows were more vigorous, more winter hardy, and more productive. We noticed the same thing at Chalet Debonne in 1996 when we received 10 inches of rain in September.

"The result has been a shift toward tiling every vine row or spacing drainage lines every nine feet. Tiling allows vines to attain maximum winter hardiness, to develop a healthier, aerated root system, and to yield larger crops earlier in the vine's life, without sacrificing quality.

"In turn, larger vinifera vineyards have spawned a shift towards vertical shoot positioning trellising, with taller trellises to give a higher ratio of leaves to fruit. This makes the effect of leaf

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BARREL ASSOCIATES INTERNATIONAL

removal more dramatic, while retaining a large, functional canopy surface.

"For us, these changes should play out with healthier vineyards and more consistent and interesting wines as these new tiled plantings come on line by 2005."

NEW YORK STATE

★

Jim Hazlitt
Saw Mill Creek Vineyards,
(Hector, NY)

"Most vineyards in the Finger Lakes are located within a mile of the lakes to prevent winter damage. Our own vineyards are on the east side of Seneca Lake from 450 feet to 1,500 feet elevation. We grow Merlot at the lake's edge; Sangiovese, Viognier, Syrah, Pinot Noir, Pinot Blanc, Chardonnay are planted next. Cabernet Sauvignon, Riesling, and Cabernet Franc are more cold-tolerant and are planted higher above the lake.

"It's only in the last 10 years that much vinifera has been planted here. You don't see much close spacing, but in recent years, there has been a move toward vertical shoot positioning and Smart-Dyson trellising. We're also using more mechanical tools to do hedging and leaf removal.

"In the next 10 years, I expect that some of the big California wineries will locate in our area, because of the inexpensive land. We will see a large increase in the planting of cold-hardy vinifera. At higher elevations, white varieties like Cayuga White, Traminette, and Vidal will increase in acreage. Cornel's new red hybrid 73-136-17, which we call Climax, will replace the older red hybrid varieites. All these will be grafted on 3309 unless a super root-stock is found." ■

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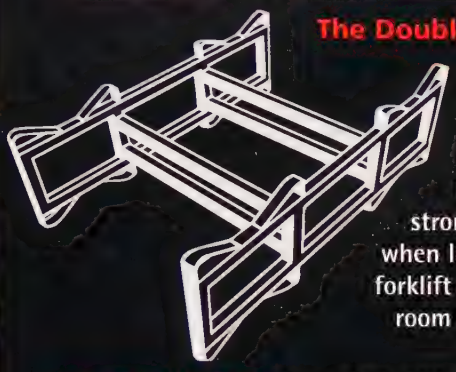
the industry standard

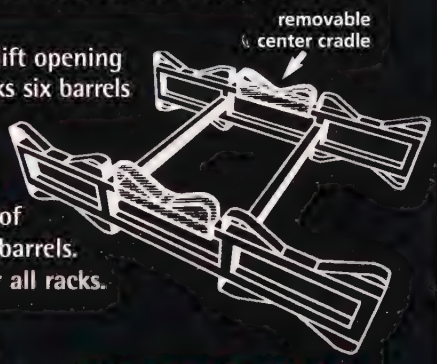
All Western Square Portable Barrel Racks (WS 29 series) are designed to accommodate Burgundy, Bordeaux and American oak barrels. The racks are powder-coated (baked enamel) which is the most durable finish available and is resistant to chipping, abrasion, impact, corrosion and chemicals.



The Double Bar Rack with two pairs of connecting bars has replaced the single bar rack (with one pair of connecting bars) as the industry's standard two-barrel topping rack. The rack is stronger and provides better safety when lifting from the side. It has a 7" forklift opening which allows for head room between the barrels in a stack.

Low Profile Rack has a 4" forklift opening which gives better stability to stacks six barrels high. With inside bars, wine can still be worked in place.

Removable Center Cradles *(optional)* provide stable stacking of a single barrel above tiers of two barrels. Available for all racks.



The Four-Barrel Rack, in spite of its 7" forklift opening, has great stability. Therefore, it is our primary recomendation for stacking six barrels high.

Since 1978, Western Square has been providing a variety of equipment to meet the ever-changing needs of the wine industry. Our products are proudly manufactured in America.

WESTERN SQUARE
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Toll-free in California: 800.367.8383
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PW PRACTICAL WINERY & VINEYARD

January / February 2000

SUPPLIER SHOWCASE

WINERY EQUIPMENT & COOPERAGE

GRAPES • JUICE • WINE

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AATAC

AATAC provides the California wine industry with the design and fabrication services required to enhance the production of some of the world's leading winemakers. The standards set forth by AATAC combined with AWS certified welders lead to the quality aluminum fabrication of catwalks, stairs, handrails, and hose racks.

AATAC is a source for industry stainless steel wine and must transfer line, receiving hoppers, screw conveyers, and sump carts. In addition, the company fabricates stainless steel drain system products and perforated screens. AATAC also provides modification and repair services for your existing tanks.

At AATAC, the staff always makes the effort to provide customers with service that is second to none. Whether you are in need of design and fabrication services or require repairs to existing systems, AATAC is the quality source for your business.

For more information, contact:
AATAC
PO Box 728, Windsor, CA 95492
tel: 707/838-3117; fax: 707/838-3009
website: locidesign.com

PLEASE SEE THE AATAC AD, PAGE 93.

JVNW, INC.

JVNW is in its third successful year of manufacturing stainless steel tanks for cap management with an innovative mechanical screw punch assembly in the wine industry. These rugged, powerful, punch-down tanks can be driven with compressed air or prewired with electric motors.

Winemakers can adjust the punch set-point to accommodate different loads — they can punch two tons or 10 tons in the same tank. They can also

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JVNW wine tanks are available from 500 gallons to 50,000 gallons, with carbon steel bases, or easy-to-maintain stainless steel legs. Look to JVNW for new and improved manway doors, square hatches that open with the press of a button, and safety features to address confined space concerns.

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JVNW, Inc.
390 S Redwood St
Canby, OR 97013
tel: 800/331-JVNW; fax: 503-263-2868
e-mail: tanks@jvnw.com

BARREL BUILDERS, INC.

Barrel Builders exclusively distributes **Tonnellerie Marchive**, **Budapesti Kadar**, and **Barrel Builders** barrels.

In the Cognac region in Jarnac, France, **Tonnellerie Marchive**, was a pioneer of long, slow toasting that produces the depth and range of flavors so sought after. The cooperage uses woods sourced from France's leading forests to produce a full range of Burgundy- and Bordeaux-style barrels.

Budapesti Kadar, Hungary, is the largest cooperage in Central Europe. Barrels are built to Barrel Builders' specification in Burgundy, Bordeaux, and hybrid styles. Oak is sourced from the Tokaj wine region.

In 1999, Barrel Builders introduced its own brand barrel, coopered to its specifications by **East Bernstadt Cooperage** in Kentucky and available in two-year and three-year air-dried oak. Wood is sourced from the mountainous Daniel Boone National Forest.

Full-Service Shop — Barrel Builders' unique reconditioning process exposes fresh oak in older barrels to provide oak flavors at a fraction of the new barrel cost. Quality barrel repair work also available.

Bungs — Choose from four silicone bung styles, including fermentation, solids, recessed, and the EasyGrip.

Maintenance Supplies — Barrel Builders also carries Proxyclean, a non-chlorinated cleaning agent effective on everything from "off" barrels to membrane presses, a range of cooperage supplies, and other barrel maintenance products.

For more information, contact:
Barrel Builders, Inc.
PO Box 268, St. Helena, CA 94574
tel: 800/365-8231 or 707/942-4291;
fax: 707/942-5426

PLEASE SEE THE BARREL BUILDERS AD, PAGE 71.

FOOD, WINE, & SPIRIT, INC.

In recent years, the French have reconsidered the benefits of some wine agents that have been used in winemaking for decades. Among these agents are tannins known as "tannins oenologiques." Suppose tannins from the best air-dried French oak wood could be carefully removed and subsequently preserved for use in winemaking. These tannins could then be precisely measured and added to grape juice or wine. This product already exists under the name — Oenotan Selection Freeze Dried Oak Tannins.

Oenotan Selection is produced from

high quality, three-year-old, air-dried oak of the Limousin, Allier, and Nevers forests. Phenolic compounds (mostly tannins) are carefully removed by the use of water, **not** ether or alcohol. The use of water to remove these tannins develops hydrolysis of the glucosides (association of tannins and sugars) which reduces bitter and astringent characteristics often associated with wood tannins.

The resulting water solution is slowly concentrated. This concentration step is analogous to the barrel toasting process as it also generates furanic compounds. The resulting solution is then freeze dried. Oenotan Selection can yield results substantially identical to the phenolic compounds found in wine that has aged in an ideal French oak barrel and costs only pennies per case.

For more information, contact:
Food, Wine, & Spirit Group, Inc.
PO Box 10234, Napa, CA 94581
tel: 707/255-2031; fax: 707/253-8234

PLEASE SEE THE FOOD, WINE, & SPIRIT GROUP AD, PAGE 47.

KLR MACHINES, INC.

In 1999, Vaslin-Bucher introduced the Bucher Xpert Grape Press. This new generation of grape press was awarded a gold medal at Sitevinitech. A similar gold medal was awarded to Vaslin-Bucher in 1992 for its Delta destemmer/crusher.

Several years ago when Vaslin-Bucher introduced the dynamic controls on its presses, certain users felt a loss of control over the pressing functions (pressure hold time, maximum pressure setting, etc.). To allow user input, this new generation of grape press enables the operators to customize operations to match their concepts of quality and productivity by adjusting the parameters of the pressing functions.

Users can control juice quality by simply adjusting flow volumes or by setting pre-determined pomace dryness (maximum pressures) and press cycle time.

This new concept in press programmation gives more control to the user, allows for establishing objectives, and promotes confidence. Programming allows for control of axial filling; pomace dumping, which can be adapted to the customer's pomace removal system; and a CIP system for internal flushing of the juice channels.

The Xpert Grape Press is available with one or two doors in capacities from 100 HL to 320 HL.

Vaslin-Bucher equipment adapts to your specific needs by stressing flexibility in its use. Combining the award-winning Delta destemmer/crusher and Bucher Xpert Grape Press will give any winemaker the tools required to extract high quality juice from grapes.

KLR Machines and Vaslin-Bucher offer the winery advanced technology in equipment and complete technical support.

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KLR Machines, Inc.
350 Morris Street, Ste. E,
Sebastopol, CA 95472-3871
tel: 707/823-2883; fax: 707/823-6954
47 West Steuben St., Bath, NY 14810
tel: 607/776-4139; fax: 607/776-9044

PLEASE SEE THE KLR MACHINES AD, PAGE 62.

CALIFORNIA CUSTOM FABRICATION

California Custom Fabrication continues to supply the wine industry with a multitude of quality products and services, including stainless steel tank fabrication, on-site tank erection, tank repairs or modification, and other winery-related equipment.

California Custom Fabrication's staff, with well over 100 years of combined experience, strives to produce quality products and provide professional and prompt service for customers.

The company works closely with various suppliers to supply complete winery and crush pad equipment for the production of premium wines. It is California Custom Fabrication's goal to develop pleasant working relationships with customers built on honesty and integrity to enable customers and employees to prosper and grow to their fullest potential.

For more information, contact:
California Custom Fabrication
Fran Denham or Mike Erion
PO Box 1469, Windsor, CA 95492
Tel: 707/838-9680 or toll-free 877/838-9680;
fax: 707/838-9682

PLEASE SEE THE CALIFORNIA CUSTOM FABRICATION AD, PAGE 72.

TCW — THE COMPLEAT WINEMAKER

TCW manufactures, adapts and distributes processing equipment to the wine and beer industries, including:

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955 Vintage Ave., St. Helena, CA 94574
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PLEASE SEE THE COMPLEAT WINEMAKER AD, PAGE 102.

OGLETREE'S

For over 50 years, Ogletree's has specialized in the customized fabrication of winemaking equipment for California's premier wineries and vineyards. These vintners rely on Ogletree's to care for the nuance and detail of their receiving hoppers, belt and screw conveyors, transfer lines, catwalk systems, and other structural components. Ogletree's eye for detail focuses on the refinements of clean, finished work, polished welds, and well-fitting assemblies.

Because of Ogletree's more than 100 years of collective experience in the wine industry, winemakers and winery owners get more than just an aluminum catwalk system or stainless steel processing equipment when they contract with Ogletree's to work with them; they get a storehouse of knowledge that no one person alone could offer. Ogletree's working knowledge of the industry enables company designers to see potential problems or flaws in design or planning of expansions and upgrades. This familiarity also allows Ogletree's to offer solutions and new designs to achieve the original, intended goal.

Ogletree's has proven to be a valuable partner to all its clients. Serving the industry from its facility in St. Helena since 1946, Ogletree's helps wineries, large and small, distinguish their products in a competitive marketplace.

For more information, contact:
Ogletree's
935 Vintage Ave.
St. Helena, CA 94574
tel: 707/963-3537; fax: 707/963-8217

PLEASE SEE THE OGLETREE'S AD, PAGE 51.

LOGIX® REFRIGERATION CONTROLS

Drawing from more than 10 years of control system design and installation in the U.S. and around the world, Logix has brought a new level of control to winemaking.

Using cutting-edge controls and computer technologies, Logix offers custom winery control systems. With a Logix system, winemaking takes a giant leap forward — to a point where fermentation temperatures are precisely controlled and a variety of winery processes are integrated. The big payoffs: more time and resources to focus on winemaking, plus a winery that operates more efficiently.

With a Logix system, winemakers can plan and implement the ideal fermentation process, generate a wealth of information about their winemaking, and improve overall facility operations. Besides making fermentation easier and more precise, Logix systems can ensure energy-efficient refrigeration equipment operation, maintain accurate barrel room control, and monitor CO_2 and other gases. The system features 24-hour remote alarm notification and access capabilities that will give you a new peace of mind.

With a Logix system, you gain access to an experienced team of controls professionals who will partner with you to meet your goals and offer service and support to keep your system working today and every day.

There is an easier, better way to control your winery.

For more information, contact:
Logix
10518 N.E. 68th Street, Kirkland, WA 98033
tel: 425/828-4149; fax: 425/828-9682

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WORLD COOPERAGE

Your one source for quality and value, World Cooperage believes in giving winemakers options. The cooperage offers French and American oak barrels (each providing different oak flavors) that are water-bent, fire-bent, dry heat oven-bent, or steam-bent.

World Cooperage's hybrid barrel, composed of French oak heads and American oak staves, has seen a rise in popularity. Barrels with extra-fine-grain oak, harvested and milled at the company's stave operations, are also available. The cooperage continues to offer two super-premium barrels: the French-coopered Barrique Bardot barrel and handcrafted TW Boswell Legacy American oak barrel.

As an economical alternative to barrels, air-seasoned toasted oak chips, tank stave systems, and barrel renewal systems are available in several configurations.

Established in 1912 by T.W. Boswell, today World Cooperage is owned and operated by fourth generation management. World Cooperage has relocated its international sales headquarters to Napa Valley's Corporate Park.

For more information, contact:
World Cooperage
2557 Napa Valley Corporate Dr., Ste. D,
Napa, CA 94558
tel: 888/33-COOPER or 707/255-5900;
fax: 707/255-5952
e-mail: info@cooperage.com

PLEASE SEE THE WORLD COOPERAGE ADS, PAGES 28, 57, 59, 61, 63.

CUESTA EQUIPMENT COMPANY

Cuesta Equipment was established in 1974 and became a California Corporation in 1980. The company has three business locations, serving the entire Central Coast of California. The San Luis Obispo store consists of 24,000 sq.ft.; the Santa Maria store is 10,000 sq.ft.; and the newest store in Paso Robles also has 10,000 sq.ft. of retail and warehouse space.

Cuesta takes pride in the depth, quantity, and quality of products and merchandise stocked in its three locations to serve customers. The business was founded on the premise of supplying customers with the complete package of tools, hardware, and materials required to perform their jobs in the best and most cost effective manner.

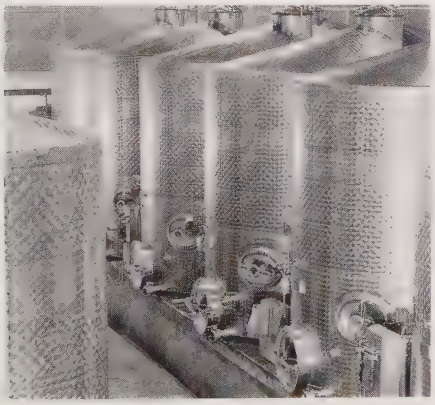
Time is money, and Cuesta provides customers with all their job requirements all in *one stop.* The customized catalog and the fabrication shop are just two key aspects that set Cuesta Equipment apart. Cuesta is very proud of its business, but the staff realizes their success is derived from you, their valued customer. Cuesta staff would like to take this opportunity to convey their thanks and gratitude.

For more information, contact:
Cuesta Equipment Company
4540 Broad Street, San Luis Obispo, CA 93401
tel: 805/544-2540; fax: 805/544-2627

PLEASE SEE THE CUESTA EQUIPMENT AD, PAGE 38.

EURO-MACHINES, INC.

Euro-Machines, Inc., is the exclusive distributor for Rieger Tanks from Germany. Rieger is a high quality manufacturer and offers a wide range of tanks in both cylindrical and rectangular shapes for all applications.



Also available from Euro-Machines are punch down, de-juicing, and vino top (both regular and pressurized) fermentors. All tanks are built to customers' specifications, but standard sizes are available to achieve the best possible size/price ratio.

Check Euro-Machines out on the web at www.euromachinesusa.com.

For more information, contact:
Euro-Machines, Inc., East
PO Box 843, Culpeper, VA 22701
tel: 540/825-5700; fax: 540/825-5789
Euro-Machines, Inc., West
5199 Fulton Dr., Fairfield, CA 94585
tel: 707/864-5800; fax: 707/864-5879

PLEASE SEE THE EURO-MACHINES AD, PAGE 26.

TONNELLERIE BOUTES

Tonnellerie Boutes, located in the heart of the Bordeaux region of France, is owned and operated by Henri Barthe and his two sons, Eric and Pierre. In the new millennium, the Barthe family will be celebrating 120 years of providing the finest French oak Burgundian and Bordeaux style barrels.

Boutes is one of the largest purchasers of standing oak trees at the National Forestry Department auctions in Allier, which insures the highest standard of quality and consistency for its barrel production.

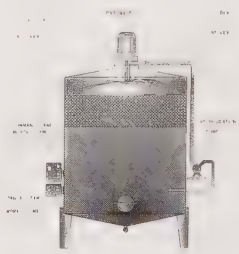
Unique to Boutes is a special water-soaking stave treatment, which is performed during the early stages of wood aging. The "green" staves are removed from the drying yard and completely submerged in concrete holding tanks. This method insures uniform treatment of each stave. The wood is then removed and air-dried for the remainder of the aging process. This treatment produces barrels with softer, more balanced tannins, which allow your wines to achieve a well-balanced integration of wood and fruit.

For more information, contact:
Tonnellerie Boutes
Manny Martinez
1001 Seascape Circle, Rodeo, CA 94572
tel: 510/799-1518; fax: 510/799-1557
e-mail: boutesusa@aol.com

PLEASE SEE THE TONN. BOUTES AD, PAGE 69.

TOP QUALITY DISTRIBUTION SERVICES

Top Quality Distribution Services is the U.S. distributor for **Enomeccanica Bosio,** a company that has been manufacturing and selling machinery for automatic winemaking processes, bottling, and the food industry, as well as designing and patenting innovative, state-of-the-art technology since 1962.



Many world-famous wineries have chosen Bosio vinification systems, including Ceretto, Gaja, Pio Cesare, Frescobaldi, Marchesi Di Barolo, and Robert Mondavi.

The Bosio cap sprayer IR 300 (shown here) works with your fermentation tank to provide labor-free, variable-speed gentle spraying. A recycling pump, a patented spraying plate, and a manual/automatic command module keep the cap constantly wet for 24 hours at an even temperature. The IR 300 produces wines with more intense coloring and bouquets, improving their overall standard.

For more information, contact:
Top Quality Distribution Services
Mark Zindroski
16417 Tulsa St., Granada Hills, CA 91344
tel: 818/360-9122; fax: 818/360-9122

PLEASE SEE THE TOP QUALITY DISTRIBUTION SERVICES AD, PAGE 5.

CANTON COOPERAGE CO.

After Canton Cooperage was purchased by the Chene Group (owners of Tonnellerie Taransaud and Tonnellerie Jacques Garnier) in 1998, the activity level at the company increased dramatically. A new storage facility was purchased; the stave and heading inventories are being greatly expanded; a building addition specifically designed for barrel toasting is being built; and quality control specifications and standards are being enhanced. There is much work to do, but it has been an exciting time.

Canton's association with its sister cooperages, Taransaud and Garnier, has been extremely positive. The Taransaud staff provides thoughtful guidance and expert assistance. Canton has joined with the other cooperages' sales staff in several new foreign markets and is looking forward to further developing the Canton name abroad.

From its five stave mills, Canton continues to offer the winemaker a well-seasoned selection of American oaks, in three sizes of the Bordeaux, Burgundy, and thin-stave styles. In 1999, it began offering barrels made with oak seasoned for three years and with selected tight grain. Since this wood is extremely limited, please call immediately to reserve your barrels for next year.

With winery customers in all corners of the world, Canton now has a web site where you can learn more about the Canton barrels and contact sales representatives via e-mail. They welcome your inquires. Find Canton Cooperage on the World Wide Web at www.cantoncooperage.com.

For more information, contact:
Canton Cooperage Co.
365 S. Woodlawn, Lebanon, KY 40033
Shipping and Service
tel: 800/692-9888; fax: 270/692-3998
e-mail: hwork@canton.win.net
website: cantoncooperage.com
Ken Seymour, West Coast Sales
tel: 707/542-1158
Tim DiPlacido, East Coast Sales
tel: 216/531-0494
Patrick Forristal, Canadian Sales
tel: 519/885-5375

PLEASE SEE THE CANTON COOPERAGE AD, PAGE 78.

IRAPP, INC.

Since 1972, IRAPP, Inc., along with Alary Corporation, has provided the wine industry with the design, construction, installation, and service of its winery refrigeration requirements. Equipment is provided that will satisfy current needs and grow to meet future needs. Water, glycol, or ammonia-based cooling can be supplied.

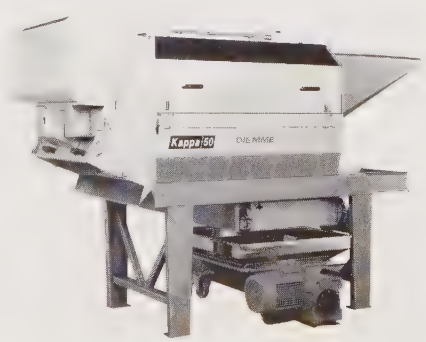
Bill Davidson, licensed chief engineer, has been providing engineering services to the wine industry since 1968. His expertise, along with his capable engineering staff and the support force of qualified mechanics, has allowed IRAPP to provide top quality refrigeration to the industry today. Twenty-six years of experience make IRAPP uniquely qualified to provide all of a winery's refrigeration and process piping needs.

For more information, contact:
IRAPP, Inc.
PO Box 129, Healdsburg, CA 95448
tel: 707/433-9471; fax: 707/433-1310

PLEASE SEE THE WESTEC AD, PAGE 81.

FP PACKAGING, INC.

fp Packaging announces the addition of Diemme's new KAPPA series destemmer/crusher to its line of processing equipment.



Engineered to provide gentle handling, flexibility, and reliability, KAPPA destemmer/crushers offer a number of unique features. The KAPPA's adjustable sliding crusher rollers and easily removable destemming cage provide for processing flexibility. Cage and beater speed variation are controlled by an Allen-Bradley frequency inverter, and beater paddles are individually adjustable, guaranteeing gentle handling of virtually all grape varieties. Extremely robust construction and heavy-duty drive systems insure the KAPPA's stability and reliability.

The Diemme KAPPA is currently available in 25 and 50 ton/hour models. Options include high volume progressive cavity must pumps with thermal dry run protection and a motorized pre-draining in-feed auger.

For more information, contact:
fp Packaging, Inc.
562 Technology Way, Napa, CA 94558
tel: 707/258-3940; fax: 707/258-3949

PLEASE SEE THE FP PACKAGING AD, PAGE 58.

PALL CORPORATION — FOOD & BEVERAGE DIVISION

Pall has wine-market specialists who are expert in solving a wide array of challenges. Advice and recommendations can be provided for wines from different geographical areas as well as for sparkling wines and derivative products. They can also assist winemakers with improving organoleptic characteristics, safeguarding physical and chemical stability and aesthetic characteristics obtained during the production process, and help reduce production costs.

Pall specialists recognize that every wine has its own specific characteristics and that all winemakers have their own specific requirements. Which is why Pall has always done everything technologically possible to dedicate the same care and attention to the product as the winemaker. From initial clarification right up to cold biological stabilization of the final product, Pall provides solutions that effectively deal with every possible implication and interaction that takes place between the various stages.

Pall's depth of experience in the treatment of wine has led to the development of many products and, most recently, to the introduction of a new Oeno Solutions philosophy: New technologies and products are developed for the future of wine production by translating Pall's experience in the industry into efficient and economical products.

This concept has enabled Pall to become an even more qualified and reliable partner, capable of economically coping with all filtration needs, as well as with separation and control throughout the entire process — from utilities to wine lees, to post-fermentation clarification, to the bottling line, to the quality assurance laboratory.

For more information, contact:
Pall Corporation
2200 Northern Blvd., East Hills, NY 11548
tel: 800/717-7255; fax: 516/625-3610
PLEASE SEE THE PALL CORPORATION AD, PAGE 9.

MEL KNOX BARREL AND BOTTLE BROKER

The excitement never ends at cooperages represented by Mel Knox.

Tonnellerie Francois Freres has just purchased the largest stave mill in France, Sogibois. This gives the whole Francois group new and better access to top quality oak staves. Francois Freres has also expanded its toasting facilities to provide even better control over this vital process.

Francois Freres d'Oregon continues to expand its stock of Oregon oak staves. In 2000, the cooperage will have the ability to make over 1,500 barrels from wood air-dried 24 months. The results for this wood are astonishing, combining the power of American oak and the flavors and sweetness of the French.

Tonnellerie Taransaud has just finished its new cooperage. This new cooperage, built on the site of the previous one, doubles Taransaud's production capacity. The splitting workshops will be moved off-site and expanded. Sales capacity (i.e. the Mel Knox allocation) will increase as the stock of properly dried wood increases.

In May, Taransaud will send a team of eight coopers to Oakville, CA, to work with a team from Bellagio Wood Tank to assemble 56 oak fermentation tanks for the new red wine fermentation cellars at Robert Mondavi Winery.

In 1999, more oak fermentation tanks, equipped with removable stainless steel tops, were installed. Harlan Estate, Oakville, CA, acquired four of them. These tanks give the winemaker flexibility for pump-overs, pigeage, or storage.

For more information, contact:
Mel Knox Barrel and Bottle Broker
505 29th Ave., San Francisco, CA 94121
tel: 415/751-6306; fax: 415/221-5873
PLEASE SEE THE MEL KNOX AD, PAGE 34.

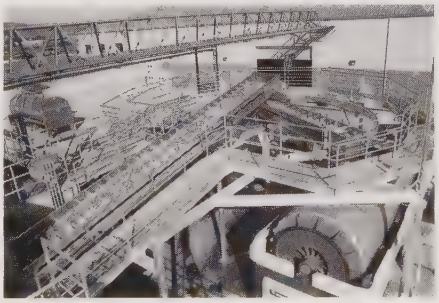
PACIFIC DESIGN & MANUFACTURING, INC.

Pacific Design & Manufacturing, Inc. (Pacific) specializes in design/build winery projects. The Company's designers, Steve Koster and Richard Quadro work early-on with clients in the design phase to produce extremely accurate drawings which reflect the process and equipment needs of the winery. Clients benefit greatly from the designers' experience as over the past 20 years they have designed and built dozens of the finest winery crush facilities in California.

Pacific's added advantage of manufacturing what it designs assures customers that the same high standard set forth in the equipment specifications is in fact realized.

Pacific's products include: screw conveyors, belt conveyors, sorting tables, process lines, must pumps, catwalks, hoppers, presses, valves, hoists, and tanks.

Whether you need new construction or a modernization project, Pacific Design & Mfg. will help formulate a master plan and design that allow for an efficient operation while remaining flexible to changes in the industry. Pacific invites customer inquiries regarding future design projects and the latest news in process equipment.



For more information, contact:
Pacific Design & Manufacturing, Inc.
30 Mill St., Building D, Healdsburg, CA 95448
tel: 707/431-3516; fax: 707/431-3519
PLEASE SEE PACIFIC DESIGN & MFG. AD, PAGE 21.

JUVENAL DIRECT, INC.

Juvenal Direct, Inc., supplies a complete line of natural cork closures from Juvenal Ferreira da Silva of Portugal and cork coating systems developed by Rudolf Ohlinger GmbH of Germany. In addition, Juvenal Direct now represents the following companies:

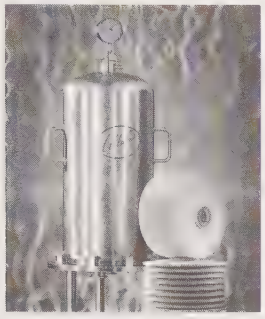
Filtrox AG of Switzerland-celebrated its 60th anniversary in 1998 and has established an excellent quality and performance record for its filter sheets and cartridge filters. Juvenal and Filtrox are now introducing the Filtrox high-performance FILTROjet® D.E. Candle and FILTROmat® pressure-leaf filters, which are available in sizes from 100 to 1,200 sq.ft. of filter area, from manual to fully automated PLC-controlled operation.

Juvenal Direct offers the full line of EPC low-pressure pneumatic membrane presses (1,000 to 25,000 liters) from A. Sutter AG of St. Gallen, Switzerland. EPC presses have a stainless steel tank and frame with one or two sliding doors, large axial feed inlets with knife valve and over-pressure control. Presses up to 5,000L capacity are fully self-contained with integrated compressors. All models are equipped with the EPC-Logic PLC control panels. The optional EPC Logic "Comfort" control panel includes a large screen with graphics display. Both control systems allow for fully automatic self-optimization of individual programs, including special programs for whole cluster pressing.

For more information, contact:
Juvenal Direct, Inc.
PO Box 4559, Napa, CA 94581-5449
tel: 707/254-2000; fax: 707/642-2288
PLEASE SEE THE JUVENAL DIRECT AD, PAGE 61.

CELLULO COMPANY

Cellulo Company has worked in the wine industry for generations offering a diverse line of products, including filtration media, fining agents, and wine processing equipment, tailored to your specific needs.



As one of the largest manufacturers of depth filter media in the U.S., Cellulo provides filters in a variety of forms and sizes, including Cellu-Flo® cellulose filter fibers, Cellupore® filter sheets and Cellu-Stack® filter cartridges. Each product is manufactured to the highest quality levels and will always perform consistently and efficiently.

Making your processing even more efficient, Cellu-Stack® sanitary filter housings reduce product loss due to leakage, minimize hold-up volume, and are ideal for filtering all varieties of high-quality wine. The housings are manufactured of 316L stainless steel and hold from one to four Cellu-Stack® cartridges (18 sq. ft. to 72 sq. ft. effective filter surface area).

In the lab, Cellulo offers the full-line of Mettler-Toledo portable and in-line dissolved oxygen analyzers, as well as pH and conductivity measuring systems. For your tank cleaning needs, Butterworth's all stainless steel Model LT-10 tank washing machine is efficient and effective. Cellulo also offers Perlick sample valves and supplies.

Cellulo consistently provides superior levels of service with the knowledge you need to get the job done.

For more information, contact:
Cellulo Company
Shadow Ostowari, Phil Crantz, Rodger Pachelbel, or Ken Stewart
81 "M" Street, Fresno, CA 93721
tel: 559/485-2692; fax: 559/485-4254
e-mail: mail@cellulo.com
website: cellulo.com

PLEASE SEE THE CELLULO CO. AD, PAGE 60.

ARTISAN BARRELS

Artisan Barrels (formerly IBC Network) is exclusive U.S. importer and distributor of French oak barrels from Tonnellerie Rousseau and Tonnellerie Saint-Martin and puncheons from Tonnellerie Allary (Cognac).

Tonnellerie Saint-Martin is a family business in the Bordeaux region with over 50 years experience. Long, natural, open-air drying (24 months and 36 months regimens available), heating over an open wood fire, and oak from Allier and in the Vosges forests insure high quality. Saint-Martin provides 225L Bordeaux Transport (22mm and 27mm), Bordeaux Ferre (22mm), and Bordeaux Tradition (22mm). In 2000, Saint-Martin will offer Oregon oak and Central European barrels seasoned for at least 18 months.

At **Tonnellerie Rousseau**, Burgundy, two generations of coopers have crafted French oak barrels for 40 years. This small cooperage's yearly production of under 5,000 Burgundy-style barrels is sold primarily to the prestigious nearby vineyards of Vosne-Romanee and Nuits St. Georges, as well as South Africa, Australia, and California. The toasting process is carefully monitored and adapted to Pinot Noir or Chardonnay barrel aging. Besides coopering 228 L Burgundy Transport (27 mm) and Tradition (27mm) from the best forests of France, Rousseau produces custom-made casks, ovals, and upright tanks, and in 2000, will cooper Central European barrels seasoned for at least 18 months.

For more information, contact:
Artisan Barrels
Jérôme Aubin
3517 Alta Visa Ave., Santa Rosa, CA 95409
tel: 707/527-8923; fax: 707/568-5640
cell: 707/696-9501
e-mail: artisanbarrels@dellnet.com

SCOTT LABORATORIES, INC.

Scott Laboratories offers machinery from Velo (filters, presses, rotary fermentors), Willmes (presses), Manzini (pumps), Armbruster (stemmer/ crushers, must pumps), Guth (mixers, stands), and MBF (rinsers, fillers, corkers, cappers, conveyers plus line design and automation).

MBF manufactures some of the most technologically advanced bottling equipment available. Two patented features include a completely automatic CIP system with no dummy bottles and a new state-of-the-art filling valve with O_2 pick-up of less than 0.22 ppm.

Scott introduces two new products: Gamajet tank cleaning systems and Ganimede fermentation tanks.

Gamajet is a technology leader in barrel and tank cleaning, offering mechanical energy from the impingement process to deliver superior cleaning, fluid-driven cleaning with no external connections, and gear-driven repeatable cleaning patterns. Full spherical cleaning thoroughly scrubs every inch of your barrel or tank in approximately three minutes at 4 GPM.

The patented Ganimede tank design uses the CO_2 force of fermentation itself to gently mix tanks. No pumps or mechanical devices are needed. Seeds fall out continuously and can be easily extracted through the bottom valve. A patented bypass valve allows accumulated gas and liquid to flood the cap. Ganimede tanks can be used for storage without modification.

Scott Laboratories supports all sales with its large parts department and trained service mechanics.

For more information, contact:
Scott Laboratories, Inc.
2220 Pine View Way
Petaluma, CA 94955-4559
tel: 707/765-6666; fax 707/765-6674
e-mail: info@scottlab.com
website: www.scottlab.com

PLEASE SEE THE SCOTT LABORATORIES AD, PAGE 10.

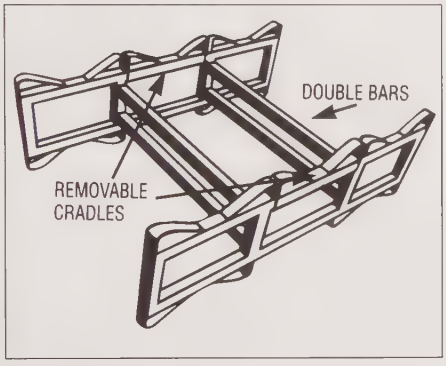
WESTERN SQUARE INDUSTRIES

Western Square is the wine industry's largest supplier of portable steel barrel racks. New this year: stainless steel racks in the two most popular models, namely, the double-inside bar (7-inch forklift opening) two-barrel rack and the corresponding four-barrel rack.

Offered in powder-coated mild steel are the above two models plus a low profile (4-inch forklift opening) inside bar rack, so it is also a topping rack, and a rack for the bottom tier of barrels, which can be pallet-jacked from all four directions.

These standard models will accommodate all barrels from 200L to 275L, but special models are also available. Regardless of which racks are used in your winery, Western Square can supply racks that will co-stack.

For those wineries still stacking barrels in pyramids, Western Square makes a cradle that replaces four chock blocks and thereby facilitates stacking.



Western Square offers two handy devices for holding a single barrel above tiers of two barrels, useful when you have an odd number of barrels in a lot. One is the previously mentioned pyramid cradle, and the other is the removable center cradle (see photo with standard two-barrel rack).

Western Square also makes a barrel-washing system specifically for use with portable racks.

For more information, contact:
Western Square Industries
1621 N. Broadway, Stockton, CA 95205
tel: 209/944-0921; fax: 209/944-0934
or 1500 Whitehall Ln., St. Helena, CA 94574
tel: 707/963-1584; fax: 707/963-7213

PLEASE SEE THE WESTERN SQUARE AD, PAGE 84.

VINCENT BOUCHARD COOPERAGES, BARREL BROKER

Vincent Bouchard Cooperages represents Les Tonnelleries de Bourgogne — an association of **Tonnellerie Damy** (Meursault), and **Tonnellerie Billon** (Beaune) — Tonnellerie Vicard (Cognac), Tonnellerie Lafitte (Cognac), and Tonnellerie Cadus (Ladoix-Serigny). Cadus is a partnership of Maison Louis Jadot of Burgundy, Tonnellerie Vicard, and Vincent Bouchard, a ninth-generation Burgundian enologist.

VINCENT BOUCHARD COOPERAGES (PVS SA.)

Les Tonnelleries de Bourgogne is highly respected by producers of Chardonnay and Pinot Noir and has been providing both barrels and puncheons (to 500L) to American wineries for over 17 years.

Tonnellerie Vicard is a 100% family-owned and operated company, which is ISO 9002 certified for the barrel fabrication process. Vicard produces various dimensions of barrels, puncheons, and oak tanks.

Tonnellerie Lafitte, managed by Jean Vicard, specializes in production of high quality Bordeaux barrels from American and hand-split Hungarian oak air-dried for three years.

Tonnellerie Cadus was conceived in 1995 to meet the increasing demand in France and worldwide for ultra premium barrels for Chardonnay and Pinot Noir. Three-year, air-dried wood is used exclusively. Two different house toasts are available, depending on the desired maturation period of wine in the barrel (for fast versus slower development).

For more information, contact:
Vincent Bouchard Cooperages, Barrel Broker
Roberta Manell-Montero
PO Box 2322, Napa, CA 94558
tel: 707/257-3582; fax: 707/254-0852
e-mail: barrels@napanet.net
website: bouchardcooperages.com

PLEASE SEE THE VINCENT BOUCHARD AD, PAGE 41.

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BARREL ASSOCIATES INTERNATIONAL

Barrel Associates International offers the finest barrels possible for your wine. Each barrel serves as a flavor platform to showcase your fruit. Lovely textures and elegant flavors marry with your best vineyard efforts to produce wine you can be proud of.

Tonnellerie Dargaud et Jaegle — For the absolute finest in craftsmanship and taste, Tonnellerie Dargaud et Jaegle Burgundy and Bordeaux barrels add lovely texture and flavors to your wine. A third generation cooper, Jean Marcel Jaegle immerses the finest air-dried French oak into hot water before bending and firing these elegant barrels. This process allows for a deep penetrating toast whose consistency provides predictable and spicy components to your wine year after year. Nevers, Tronçais, Allier, Vosges, Jura, Darney, and Les Bertranges are some of the very tight-grained woods that are available from Tonnellerie Dargaud et Jaegle.

Maison Louis Latour — The barrels that have made Corton-Charlemagne the legendary wine it has become are available in limited quantities through Barrel Associates International. Each barrel is handcrafted in traditional Burgundian style and made from a combination of Allier and Vosges woods.

Classic American Oak — Sophisticated flavors of Barrel Associates American oak add texture, complexity, and finesse to fine wines. Completely air-dried wood is coopered in fire-bent tradition or skillfully treated to Barrel Associates' waterbent and DeepToast™ formats. Extended firing and toasting time reveals pleasing undertones and reduced oak tannins. Choose flavors and toasting requirements for perfect integration and superb results.

For more information, contact:
Barrel Associates International
575 Lincoln Ave. #200, Napa, CA 94558
tel: 707/257-0714 (CA, OR, WA)
800/227-5625; fax: 707/257-0742

PLEASE SEE THE BARREL ASSOCIATES AD, PAGES 12, 83.

PICKERING WINERY SUPPLY

Pickering Winery Supply (PWS) offers stainless steel tanks as well as oak barrels from several manufacturers.

Modern Stainless & Design manufactures some of the finest stainless steel tanks on the market. Visually striking, they incorporate brass accents, more substantial threads, and higher grade finishes and hardware. The four owner-operators fabricate alongside the 20 other welders, thus keeping costs down and quality up. Call Pickering for an information packet and price quote, including references, and pictures!

Tonnellerie Meyrieux is a small Burgundian cooperage that specializes in extremely long toasts: its medium, "pain grille" barrels are 90 minutes on the braziers. Each barrel is handmade by the cooper, Antony Meyrieux. Combining traditional craftsmanship with unique innovations, nothing is overlooked to make some of the finest barrels in Burgundy. Quantities are extremely limited.

Tonnellerie Vernou firmly believes that the best barrels are the result of careful control over the entire production process. From buying the logs to splitting staves and building the barrels, producing a good, consistent product every year has been Vernou's goal. Besides the usual forest choices, Vernou also offers the option to specify super-fine, fine, or medium grain; regular or extra-smoky toast; and "waterbending" the barrels to remove the bitterest tannins.

Tonnellerie de La Grande Champagne unites a master cooper with a forestry expert who has acquired and selected logs for one of the most prestigious coopers in France. This relatively new cooperage already has an impressive list of Bordeaux references.

For more information, contact:
Pickering Winery Supply
888 Post St., San Francisco, CA 94109
tel: 415/474-1588; fax: 415/474-1617

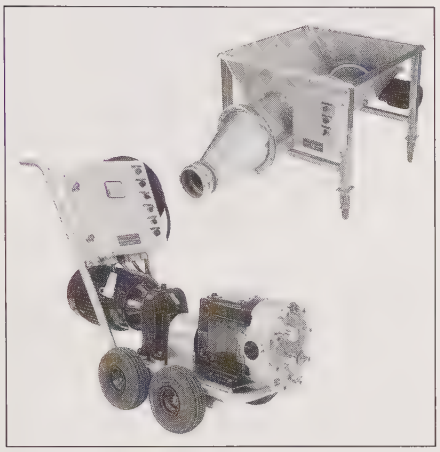
PLEASE SEE THE PICKERING WINERY SUPPLY AD, PAGE 75.

CARLSEN & ASSOCIATES

Carlsen & Associates designs and manufactures processing equipment for the wine industry with a primary product line of pumps and fruit/juice handling systems. In its ongoing effort to provide the simplest solutions for your winery needs, the company has recently added two new products.

Carlsen's portable ozone system will help you improve sanitation and microbe control. It is **simple, affordable,** and **low maintenance**.

Also new at Carlsen is a portable incline screw receiver with a 6-foot x 6-foot stainless steel bin. It offers low loading height, variable speed, and adjustable height.



Among the company's most versatile products is a system based on a Waukesha positive displacement pump, controlled by a variable-speed, AC-frequency controller. It pumps must at one to 80 tons per hour, up to 330 gallons per minute. The system does racking, transfers, barrel transfer, pump overs, filtration, and pumps the wine to the filler for bottling. This is truly the one pump that will do everything in the winery. No need to purchase specific pumps for each process.

Carlsen also offers a full line of Waukesha centrifugal and Yamada air pumps.

The in-house expertise and experience at Carlsen can help make your operation more efficient and effective.

For more information, contact:
Carlsen & Associates
1439 Grove St., Healdsburg, CA 95448
tel: 707/431-2000; fax: 707/431-2005

PLEASE SEE THE CARLSEN & ASSOCIATES AD, PAGE 19.

STAVIN INCORPORATED

StaVin Incorporated designs oak infusion systems offering versatility and cost-effective alternatives to oak barrels. Premium quality French and Hungarian 30-month seasoned oak and 36-month seasoned American oak are traditionally fire-toasted to produce elegant flavor profiles in all toast levels, paying strict attention to thermal parameters to ensure thorough heat penetration.

StaVin's Modular Tank Units, with full staves, achieve the maximum benefit in stainless or oak tanks. StaVin's French Oak Stave Segments (15-lb. bags) and American or Hungarian Oak Beans (10 or 20-lb. bags) are conveniently packaged in food-grade, FDA-approved nylon bags to be placed directly in the tank.

StaVin offers four methods to impart neutral barrels with equivalent flavors of new French, Hungarian, and American oak barrels. Traditional Barrel Inserts are full staves held in place with stainless rings. The other three methods are unique alternatives to pulling heads, including StaVin's patented Oaksleeve, comprised of mini-staves packaged in FDA-approved nylon; StaVin's new Barrel Replica, comprised of 30 staves in 10 sections suspended through the bung hole; and StaVin's stainless steel Infusion Tube, loaded with Oak Cubes.

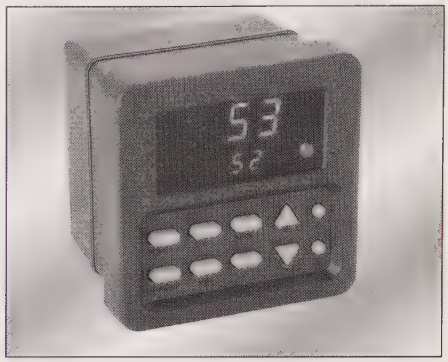
StaVin represents two French oak barrels: three-year seasoned Sansaud and two-year seasoned Berthomieu. Also available is the two and three-year seasoned Kelvin American barrel.

For more information, contact:
StaVin Incorporated
PO Box 1693, Sausalito, CA 94966-1693
tel: 415/331-7849; fax: 415/331-0516
e-mail: info@stavin.com

PLEASE SEE THE STAVIN AD, PAGE 50.

REFRIGERATION TECHNOLOGY, INC.

Refrigeration Technology, Inc., (RTI) designs, installs, and services industrial refrigeration and humidification systems for the wine industry. RTI is working on a new glycol chiller design using propane-fired engines to drive mini-screw compressors from 40HP to 150HP.



More than 3,000 of RTI's SUPER STAT wine tank temperature controllers have been installed. Each SUPER STAT offers: bright LED readout for set point and temperature, min/max memory, high and low alarm, heat/cool switch, splash-proof case, and optional computer interface with a PC. RTI will soon release a new version of the SUPER STAT software. The new version will be Modbus™ compatible for use on industrial process control networks and personal computers.

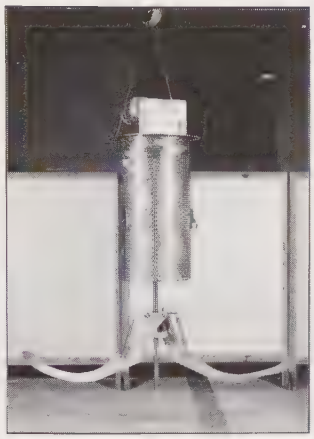
For more information, contact:
Refrigeration Technology, Inc.
PO Box 368, Middletown, CA 95461
tel: 707/995-4790 or 800/834-2232;
fax: 707/995-4792

PLEASE SEE THE REFRIGERATION TECHNOLOGY AD, PAGE 75.

TONNELLERIE RADOUX USA

Tonnellerie Radoux, cooper of Bordeaux- and Burgundy-style barrels, also specializes in large capacity oak vessels: round and oval casks and upright tanks. Tonnellerie Radoux selects only Haute Futaie-grown oaks from the Center of France and the Vosges areas and white oak from Missouri, Minnesota, and Appalachia forests. All barrels are coopered in the French tradition.

In an effort to respond to the increasing American oak demand,



the cooperage in California is moving to a new 24,000-square-foot facility, including an environmentally controlled warehouse.

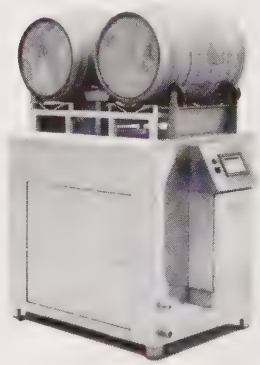
This year, Tonnellerie Radoux is introducing an innovative automated pigeage (punch down) machine — "**Robot Pigeur.**" A winemaker and an engineer combined their talents to reinvent the old technique of punching down the cap, which improves the effects of fermentation and gently extracts tannins and aromas to increase organoleptic qualities. A prototype will be presented during the Unified Symposium trade show in January.

For more information, contact:
Tonnellerie Radoux USA
480 Aviation Blvd., Santa Rosa, CA 95403
tel: 707/284-2888; fax: 707/284-2894
PLEASE SEE THE TONN. RADOUX AD, PAGE 37.

PROCESS ENGINEERS, INC.

Process Engineers, Inc., (PEI) has served the wine, food, and beverages industries for over 40 years.

The company designs, manufactures, and installs systems for the complete spectrum of grape processing and packaging. The company also serves as a distributor for pumps (centrifugal, positive displacement, pneumatic), valves (ball, butterfly, diaphragm), controls (loop, PLC), stainless fittings and tubing, hoses, and gaskets.



PEI has designed and built custom systems for automated pumping/batching, heat transfer (automated must/juice/wine heating and cooling), and CIP.

For years, PEI has supplied the wine industry with major processing equipment , including destemmer/crushers, presses, filters, barrel washers, and more. In the past this equipment was imported from Europe. PEI now offers American-designed and built process equipment, utilizing standard and locally available parts.

The company's barrel washers (two- and four-barrel capacity) have been very well accepted and are fast becoming a standard in the industry. PEI has also designed and has currently available fully automated, multiple rack barrel-washing and filling lines.

PEI's destemmer-crusher completed field trials during the 1999 crush and will be available for delivery in year 2000.

For more information, contact:
Process Engineers, Inc.
26569 Corporate Ave., Hayward, CA 94545
tel: 510/782-5122; fax: 510/785-8187
PLEASE SEE THE PROCESS ENGINEERS AD, PAGE 23.

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http://www.snapngrow.com
email: info@snapngrow.com

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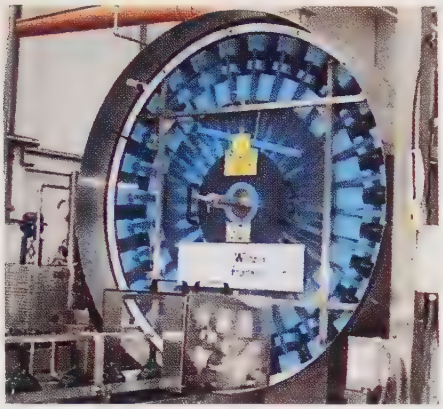
McBRADY ENGINEERING, INC.

The ORBIT Bottle Cleaner/Gas Injector manufactured by McBrady Engineering cleans and gas flushes wine bottles with nitrogen or carbon dioxide immediately prior to filling. Nitrogen is injected through individual rinse tubes inserted into the neck of each bottle for direct gas injection.



The compact ORBIT Cleaner mounts on the filling line conveyor and requires as little as 25 inches of conveyor space. It provides, with its ultra-simple design, an almost carefree operation. The ORBIT Cleaner/Gas Injector can also be combined with McBrady's three- or four-Belt Unscrambler to create a single machine assembly for the feeding, cleaning, and gas flushing of the bottles. Only one change part is required on most models to run 750 ml, 500 ml, and 375 ml (using plastic Rotor inserts). The ORBIT also now features "tool-less" change-over, making a switch-over simpler.

The ORBIT Cleaner/Gas Injector is now available in five models of varying line speeds and costs. The Model #40 is the economy model with speeds of 40 bpm, and the Model #220 has a high-speed range of up to 270 bpm. The Model #220 features McBrady's patented Duplex Rotor Design that handles two bottles per Rotor Pocket for twice the gas injection time or higher line speeds.

For more information, contact:
McBrady Engineering, Inc.
PO Box 2549, Joliet, IL 60434
tel: 815/744-8900; fax: 815/744-8901
e-mail: sales@mcbradyengineering.com
website: www.mcbradyengineering.com

PLEASE SEE MCBRADY ENGINEERING AD, PAGE 74.

INNERSTAVE, INC.

"Original ideas are few," and most are not effective tools to save time or money. Innerstave is the original barrel insert and has been used as an effective tool to add oak character to wines for over 19 years. It saves money through lower costs for oak barrel flavors.

Since 1979, Innerstave has gained wide acceptance in all forms of barrels and tanks because of its exclusive, non-invasive, cleanable design. Innerstave, designed for stainless tanks, requires no welding and is installed by the company's own qualified coopers.

Innerstave receives highest acclaim for its award-winning, premium oak character which can be found in many highly rated wines. Innerstave's on-site supply of aged French and American oak ensures availability of prepared oak for each Innerstave order, and gives the winemaker control of oak type, wood-to-wine ratio, and toast level. Each is important when making award-winning wines.

Innerstave works closely with winemakers so the decisions of wood type and toast level match each wine. These decisions are then carefully adhered to by Innerstave design, manufacturing, and installation staff. All wineries purchasing from Innerstave are guaranteed satisfaction.

For more information, contact:
Innerstave, Inc.
Bob Rogers
24200 Arnold Dr., Sonoma, CA 95476
tel: 707/996-8781; fax: 707/996-1157
e-mail: bob@innerstave.com

PLEASE SEE THE INNERSTAVE AD, PAGE 6.

STOKES LADDERS, INC.

Stokes Ladders, Inc., a leading manufacturer of aluminum orchard ladders for over 35 years, also offers quality rolling barrel-room ladders specifically designed to fit in the narrow aisles between stacks of barrels. Now used in over 60 wineries on the West Coast, these ladders provide workers safe access to barrels without having to climb racks, and also alleviate having to lower the barrels with a forklift to be checked or topped.

Ladders can accommodate stacks from two barrels to six barrels high. Ladder heights, combined with their narrow 18-inch width, allow for maximum barrel count in the barrel room.

The ladders are constructed of high-strength, light weight structural aluminum, and feature four heavy-duty, non-marking locking casters, a roomy 16-inch x 24-inch top platform with handrails and toe boards, 7½-inch deep steps, and a comfortable 60-degree climbing angle.

Options include a back ladder and different base configurations. Because of their narrow base, these ladders must only be used in the close confines of the barrel aisles. Custom ladders are available.

For more information, contact:
Stokes Ladders, Inc.
PO Box 445, Kelseyville, CA 95451
tel: 707/279-4306 or 800/842-7775
fax: 707/279-2232
e-mail: ladders@pacific.net

PLEASE SEE THE STOKES LADDERS AD, PAGE 24.

THE BOSWELL COMPANY

The Boswell Company represents three specialized French oak tonnelleries.

Tonnellerie de Mercurey is in the village of Mercurey near Chalon-sur-Saone. Nicolas Tarteret, owner, operates a stave splitting operation with full control of oak sourcing. De Mercurey barrels are blends of oak from cool climate forests in eastern and central France. Toasting at the workshop requires 100 minutes per barrel, double the firing time of most other producers.

Jean-Louis Bossuet's tonnellerie and stave splitting operation are integrated at St.-Simon-de-Bordes in the Charente Maritime region. Clientele at St. Emilion and Pomerol specify his barrels for their Merlot wines. Barrels are very tight grain French oak, carefully selected in the forest by Jean-Louis, an "artistic" cooper and wood expert.

Tonnellerie Berger is family owned and operated at Vertheuil, a small village in the Medoc. All oak at Berger is properly air-dried as thin staves for at least 24 months. House toasting requires 35 to 40 minutes maximum. The great Medoc chateaux are enthusiastic clients. You will not find a more committed French barrel producer for powerful Cabernets.

The Boswell Company also supplies quality tools including French wine thieves, domed silicone bungs, dodines, Bulldog's Pup, foot-valves, and hose cleaning balls.

For more information, contact:
The Boswell Company
1000 Fourth St., Suite 640
San Rafael, CA 94901
tel: 415/457-3955; fax: 415/457-0304

PLEASE SEE THE BOSWELL CO. ADS, PAGES 67, 108.

DEL INDUSTRIES, INC.

DEL Industries, Inc., is a leader in the ozone industry with over 20 years experience in manufacturing high quality, state-of-the-art, cost-effective ozone purification systems. DEL Industries offers full engineering support, custom ozone system designs, and on-site training seminars. There are currently over one million DEL

ozone systems in use worldwide.

This year, DEL Industries introduces mobile ozone purification systems to the wine industry for barrel cleaning, filler CIP, facility washdown, tank sanitation, mold and spore reduction in barrel rooms or caves, and hose cleaning.

System features include stainless steel, waterproof enclosures, built-in ozone management systems to accurately control applied ozone dosage and minimize ozone off-gas (meeting OSHA ozone off-gas requirements), built-in oxygen concentrators, and ozone injector assemblies.

The AGW-0500 flow-through system produces 2 to 2.5 ppm applied ozone at 10 GPM, while the AGW-1500 recirculating system produces 3 to 3.5 ppm applied ozone at 20 GPM.

Multi-purpose accessory attachment options for the AGW-0500 include a barrel washing nozzle/wand and CIP adapter. Optional attachments for the AGW-1500 include CIP accessories and Tom Beard barrel-washing accessories. Included with both units are a complete operation and safety manual and a two-year warranty.

For more information, contact:
DEL Industries
3428 Bullock Ln., San Luis Obispo, CA 93401
tel: 800/676-1335; fax: 805/541-8459

PLEASE SEE THE DEL INDUSTRIES AD, PAGE 29.

MENDOCINO COOPERAGE

In 1998, Mendocino Cooperage completed a 27,000-sq.ft. facility dedicated to premium wine barrel production. At the new Hopland cooperage, the company has combined the traditions of the craft with innovative technology and an inventive American spirit.

Raw oak material is selected from specialized mills in France, Hungary, and the U.S. The cooperage's three different American white oak origins are sourced and designated Appalachian, Ozark, and Northern. All oak is aged with nature's wind, sun, and rain extracting the natural oak tannins and softening the flavors and aromas in the wood. Albany, Kentucky, has been selected as the perfect aging location for this American oak, because it has an annual average rainfall of 65 inches and humidity above 80%.

Jointing and traditional barrel toasting are performed at Hopland. Carefully monitored oak fires are timed to slowly heat the wood and achieve deep penetration. In addition to classic Bordeaux and Burgundy shapes, the cooperage offers 70-gallon (265 liter) and 80-gallon (300 liter) capacity barrels.

Buy direct, and take advantage of Mendocino Cooperage's new toll-free number, 888/340-2244, and on-site customer service staff. Learn more about how the company's new standard of service can benefit you, your wine, and your bottom line.

For more information, contact:
Mendocino Cooperage
12901 East Side Rd., PO Box 549
Hopland, CA 95449
Customer Service:
tel: 707/744-7425, 888/340-2244
Raymond Willmers, Sales Manager
tel: 707/744-7658; fax: 707/744-7422

PLEASE SEE MENDOCINO COOPERAGE AD, PAGE 111.

PROSPERO EQUIPMENT CORPORATION

Prospero Equipment Corporation and AWS of California (PEC/AWS) bring to the industry one source for the most complete line of packaging and process equipment for the winery. The company's specialty is the design and installation of wine packaging lines featuring GAI monoblocks, one of the world's most popular lines of wine bottling equipment, and the Kosme precision, rotary, pressure-sensitive, and glue-labeling machines.

PEC/AWS also has a complete line of process equipment, including CMA destemmers; Della Toffola presses, filters, thermo-vinification, and instant cold stabilization equipment; and DeSilla rotary fermentors and automatic red wine fermentor tanks. PEC/AWS is unique in the industry in its ability to offer cost-effective solutions to any size winery from the smallest start up to the largest.

All of PEC/AWS equipment is offered with expert consultation, design, installation, and after-the-sale service. For more information on PEC/AWS's complete line of winery equipment, visit the web site: www.wineryequipment.com.

For more information, contact:
PEC Main Office
tel: 888/732-1222; fax: 914/769-6786
e-mail: prospero@cloud9.net
website: wineryequipment.com
AWS California
tel: 888/252-7036; fax: 707/838-3164
e-mail: aws@sonic.net
PEC Midwest
tel: 319/263-1394; fax: 319/263-1698
e-mail: davemetz@muscanet.com

NADALIE, U.S.A.

Tonnellerie Francaise has begun to do business as Nadalie, U.S.A., to recognize the Nadalie worldwide association. Nadalie, U.S.A., is the oldest French-style cooperage in the U.S., offering a variety of barrels meticulously handcrafted to your specifications for your wines.

Nadalie, U.S.A., offers American, French, and Hungarian oak barrels made in Calistoga, CA. It also provides the finest traditional French oak barrels made in France from Nadalie, Bordeaux, and Tonnellerie Marsannay in Burgundy.

Over the last two years, Nadalie, U.S.A., has invited hundreds of winery personnel to taste in the American oak *terroir* trials. The third-year tastings will begin in early 2000. Look for announcement of time and place — be sure to sign up early. The 1998-99 summary was mailed in December.

The office space at the cooperage has been remodeled, and you are encouraged to stop by to visit the new facility.

Wood inventories are high in preparation for the 2000 crush. After two years of light crops, an average to heavy crop is anticipated. Place orders early for production scheduling.

Wineries that purchased trees in May 1996 at the first French Forest Tree Auction in America will be receiving their barrels made from their own trees for the 2000 crush.

For more information, contact:
Nadalie, U.S.A.
Duane Wall, Alain Poisson, or J.C. Deguy
PO Box 798, 1401 Tubbs Ln.,
Calistoga, CA 94515
tel: 707/942-9301; fax: 707/942-5037
East Coast: **Tom Cottrell**
tel: 607/266-8214; fax: 607/226-7051

PLEASE SEE THE NADALIE U.S.A. AD, PAGE 55.

SANTA ROSA STAINLESS STEEL

Santa Rosa Stainless Steel (SRSS), the U.S.'s largest wine tank manufacturer, produced a record amount of 300,000- and 350,000-gallon tanks in 1999. Outstanding craftsmen allowed the company to produce over 650 quality tanks on time, for a smashing finale to the millennium. SRSS is now in its 32nd year in business and has passed a significant landmark, recently producing its 16,000th tank.

Job site retrofitting has also become a large part of SRSS's expertise. This includes repairing damaged tanks, rotating tops, increasing existing tank heights, and adding manways, jackets, cooling panels, and fittings.

The most popular SRSS item is a small and efficient 24-inch x 60-inch cooling panel for insertion into macro bins during small lot fermentations. Some are small enough to fit through an 18-inch top door as a removable panel. Don't forget the possibility of putting panels into wooden tanks for more exact temperature control.

For more information, contact:
Santa Rosa Stainless Steel
PO Box 518, 1400 Airport Blvd.
Santa Rosa, CA 95402
tel: 707/544-7777; fax: 707/544-6316
e-mail: rod@srss.com
website: www.srss.com

PLEASE SEE THE SANTA ROSA STAINLESS STEEL AD, PAGE 25.

VALLEY PIPE & SUPPLY, INC.

Valley Pipe & Supply, Inc., is a third-generation pipe, valves, and fitting distributor, established in 1940. Valley Pipe and Supply opened a new branch in Napa Valley in 1999.

The showroom at 4405 Solano Ave. has Defranceschi presses and tanks, Milani destemmers, Enopompe piston pumps, and Valley pumps and pumpovers on display. New items are McClain ozone equipment and Spadoni filters. Shelves are stocked full of all types of fittings, valves, stainless steel tubing, wine hose, and related industrial items. Valley Pipe also bands hose on site.

In 1989, Valley Pipe acquired the

patterns of Valley Foundry & Machine Works, which made Valley Pipe a full-service supply house to the wine industry and gave it a strong position in the industrial, utility, and food processing business.

The Valley Pipe shop assembles pumps and related materials and fabricates various configurations of valves and fittings for the wine industry.

The company has established a working relationship with several European manufacturers of winery equipment, distributing Defranceschi wine presses, punch-down tanks, Frigopack, and stainless tanks, as well as Milani crusher/destemmers, rotary fermentors, Enopompe piston pumps, in sizes from 85 to 700HL per hour, and the full line of Spadoni filters.

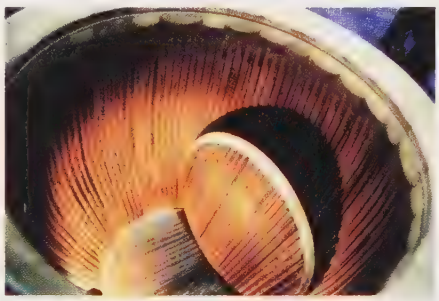
For more information, contact:
Valley Pipe & Supply, Inc.
1801 Santa Clara, Fresno, CA 93721
tel: 559/233-0321; fax: 559/233-1713
4405 Solano Ave., Napa, CA 94558
tel: 707/226-6427; fax: 707/226-7593

PLEASE SEE THE VALLEY PIPE AD, PAGE 33.

SEGUIN MOREAU U.S.A., INC.

The taste of an exquisite wine is the result of a marriage of flavors from the grapes themselves and the barrels that hold the wine during the aging process. Seguin Moreau's commitment to quality and consistency is the reason why its barrels are in the cellars of wineries throughout the world. But it is the cooperage's dedication to research that has resulted in a vast product line in American, French, and European oak.

Seguin Moreau's new *U-Stave Barrel*, available in American Oak, is just an example of the innovative and successful efforts of the Seguin Moreau Research and Development team. *The U-Stave Barrel* has skillfully measured grooves in the staves, allowing for a greater depth of toast. It enhances the wine with depth and elegance, providing a sweet, rich palate with a subtle toasty quality.



Thanks to the work done by Seguin Moreau under the direction of Alain Fouquet, a fourth-generation master cooper and president of Seguin Moreau's U.S. operations, Seguin Moreau blends prestigious French tradition, American resources, and a dedication to fine winemaking that erases all boundaries.

For more information, please contact:
Seguin Moreau, U.S.A., Inc.
151 Camino Dorado, Napa, CA 94558
tel: 707/252-3408; fax: 707/252-0319
e-mail:
seguinmoreauUSA@seguinmoreau.com
website: www.seguinmoreau.com

PLEASE SEE THE SEGUIN MOREAU AD, PAGE 22.

ALARY CORPORATION

dba Westec Tank Company

Westec Tank Company (WTC) a division of Alary Corporation is continuing to improve and innovate the wine tank manufacturing process. Its state-of-the art approach to tank manufacturing, along with its seasoned and well-trained personnel, allows for production of top quality static stainless steel wine.

Westec Tank can build wine tanks up to 45,000-gallon capacity under its own roof and can build tanks up to 250,000-gallon capacity on site. Westec manufactures rotary fermentors of 28T, 50T and 100T, which were developed and licensed by A&G in Australia for distribution by Conetec.

The Westec structural division can provide a complete crush pad design, manufacture, and installation, and design and install catwalks to meet any winery requirements.

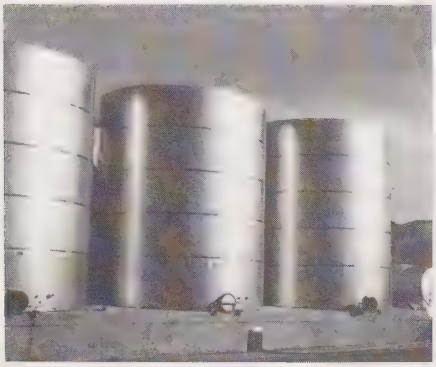
For more information, contact:
Alary Corporation
PO Box 129, Healdsburg, CA 95448
tel: 707/431-9342; fax: 707/431-8809

PLEASE SEE THE WESTEC TANK AD, PAGE 81.

TONNELLERIE SAURY

Tonnellerie Saury is a third-generation cooperage situated at the base of the Massif Central mountain range in France. Saury is conveniently located near the central forests of France, allowing the cooperage to select only tight grain wood. Therefore Tonnellerie Saury provides the finest quality wood to its clients.

Tonnellerie Saury focuses on the needs of the winemaker and adapts the barrels accordingly. As a consequence, the cooperage has developed an immersion bending process in addition to its traditional wood fire bending. Saury continues to explore new methods of production, with a respect for the traditions of the past.



equipment you need — just as they have for many of the world's top winemakers. You can count on them for some of the highest quality, custom-built stainless steel tanks, both jacketed and non-jacketed, up to 750,000 gallons. Promac's design technology and experience have proven the company an industry leader in custom fabrication.

Promac also offers a diverse line of processing equipment, which can integrate into your current facilities. With KS-Avery presses, you will realize higher yields with versatile volume capacity. As an exclusive distributor of Amos crushers and destemmers, Promac offers the state-of-the-art in "from-the-field" technology.

New for 2000 is **Promac's rotary fermentor**, which allows for even and consistent fermentation without hassle.

Most important, Promac has the experienced service and repair team, competitive prices, and dependable delivery you expect.

For more information, contact:
Promac Fabrication & Equipment, Inc.
Jim Mosqueda
5778 W. Barstow, Fresno, CA 93722
tel: 559/271-9222, 888/776-6220
fax: 559/271/9312

POWER INDUSTRIES

Power Industries, established in 1951 as Santa Rosa Bearing Company, is a leader in meeting the ever-growing needs of today's wine business. In-house trained professionals are ready to work directly with vintners to meet any challenge.

Power Industries maintains, in stock, one of the most complete lines of winery-related industrial products in Northern California. The combination of quality products and qualified industrial experts gives Power Industries an edge over the competition.

From vineyard ... A large inventory of industrial equipment is kept in stock, including harvesters, spray-rigs, diskers, and much more! Power Industries has the ability to troubleshoot and make recommendations on hydraulic and mechanical systems and can analyze, evaluate, and recommend the proper components to the client's satisfaction.

To crushing ... Power Industries maintains a wide variety of bearings and power transmission products geared to the wine industry. Also in stock are many material handling products, such as gear reducers, screw conveyors, motors, and variable-speed controllers for equipment.

To processing ... Because of close connections with hose manufacturers, customized products are developed that meet specific needs. Power Industries carries suction and transfer hoses used during fermentation as well as equipment needed for the wash-down process. Also available are table-top conveyor chains, bottling line rail and all necessary support equipment, including jet melt adhesives for case sealing!

These are just a few of the reasons Power Industries has been a leading single-source supplier in winery equipment for nearly 50 years!

For more information, contact:
Power Industries
Dennis Narduzzi
tel: 707/541-2244

PLEASE SEE THE POWER INDUSTRIES AD, PAGE 44.

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Silverado Vineyards

RLS EQUIPMENT CO., INC.

RLS Equipment has provided the wine industry with quality equipment and personal service for more than 38 years. RLS is the authorized agent in North America for KIESEL, MAGITEC, PERA, STRASSBURGER, and KREYER. RLS can supply your winery with a complete crushing and pressing facility.

The MAGITEC stemmer/crushers and receiving systems are available in capacities from seven to 75+ tons per hour, with efficient design, durable construction, gentle action, and at affordable prices.

PERA membrane presses are available in 30hL to 320hl capacities with either an open-slotted or enclosed-drum configuration. The PERA H1000 stemmer/crusher has been proven a consistent 100+ ton per hour unit.

KIESEL progressive cavity pumps are available in both hopper and in-line styles from 1,000 liter per hour to 200+ tons per hour.

KREYER supplies a complete line of temperature control equipment from portable chilling units to complete cooling plants.

STRASSBURGER offers the highest quality plate and frame and lees filters available. Stainless steel construction with either stainless steel or noryl plates are durable and easy to clean.

RLS offers a complete line of stainless steel fittings, valves, and accessories, from DIN thread to racking arms, a wide variety of quality filter pads, domestically produced replacement membranes for most presses, and an extensive inventory of used winery equipment.

For more information, contact:
RLS Equipment Co., Inc.
1017 White Horse Pike, Egg Harbor, NJ 08215
tel: 609/965-0074; fax: 609/965-2509
or West Coast tel: 800/527-0197

PLEASE SEE THE RLS EQUIPMENT AD, PAGE 30.

NAPA FERMENTATION SUPPLIES

Napa Fermentation Supplies offers a full line of winemaking equipment and supplies, including LA Inox stainless steel tanks in variable capacity with adjustable lids in sizes from 26 gallons to 1,321 gallons and closed top tanks from 79 gallons to 3,963 gallons, with or without manway.

Also available from Napa Fermentation are Karcher hot water pressure washers with 1,300 psi to 3,000 psi and temperatures from 86° to 285° steam; Jabsco pumps 1" and 1.5" with DC or AC inverter drive; Zambelli must pumps 2" and 3" with AC

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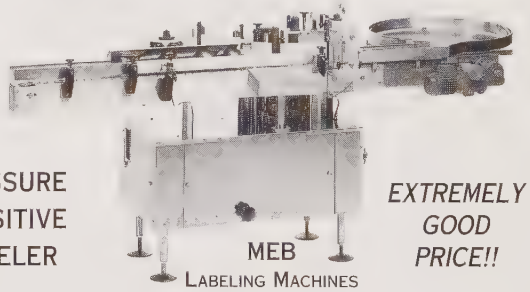

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and mechanization.

The tendency toward larger vineyards with more mechanization will surely continue. Labor input in some vineyards can be as high as 300 hours per acre per year, yet others internationally are farmed with only 20 hours per acre per year.

The tendency toward outsourcing more vineyard work — such as land preparation, vineyard installation, spraying, harvesting, and pruning — will continue, and specialized vineyard management companies will offer an increased range of services, including vineyard monitoring.

Vineyard monitoring and quality assurance procedures will become more common, as producing grapes to specification becomes more the norm. This will involve more plant measurements to facilitate monitoring canopy management and water stress and to predict yield. Environmental monitoring will become more common, especially as a guide to pest and disease control. There will be greater reliance on short-term and very localized weather forecasts to assist in pest and disease control, as well.

I do not think that yields will alter much, especially for the highest and medium quality wines. However, there is considerable potential to improve yields for lower quality wines. The yield limit, which is determined by the amount of sunshine energy received and the vine's physiology, is around 40 tons per acre, and this yield has nearly been attained by very efficient table-grape vineyards in Israel. Perhaps we will see more winegrape vineyards approach this yield for low price-point wine in the future.

Avoiding environmental degradation will continue to be an important issue, both to vineyard management and the community at large. Programs based on environmental sustainability and maintenance of performance, such as the LIVE program used widely in Oregon, will become more common.

Product specification

Vineyards of the future will produce to more tightly defined product specifications. Many of the vague concepts about grape quality will be replaced by sophisticated chemical and physical measurements of grape composition. Vineyards will be farmed according to the price-point of the grapes and resulting wine. There will be increasing recognition of vineyard management as a tool for manipulating wine quality. Perhaps there may even be recognition of this in the popular press (see *PWV*, May/June-1999, "Viticulturists are the real winemakers").

The health of planting material will improve, as testing and elimination of pathogens becomes more common. Likely vine nurseries will assume more responsibility in this area and in growing their own increase blocks. We can also expect to see more, rather than less, clonal diversity. New varieties will con-

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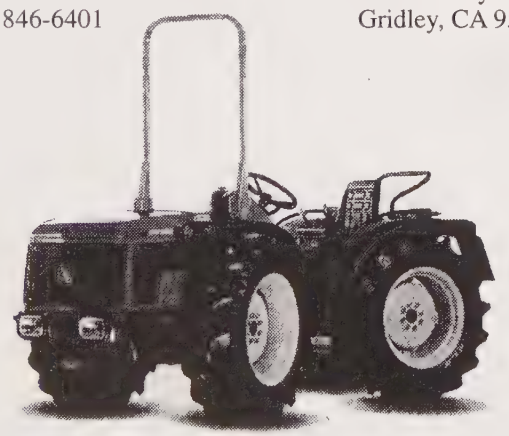

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tinue to be created, but their adoption will depend more on wine-marketing issues than viticultural performance. I see little likelihood that genetically-modified varieties will have much impact.

Personnel

Vineyard managers of the future will be better educated, although this does not imply that the desired instruction should be more theoretical than applied. Government services will likely continue to be reduced, while private industry will continue to develop replacement services. Industry organizations will also become stronger to fill the void of shrinking government commitment.

Conclusion

Some issues are unlikely to change, however. Since wine consumption is subject to many vagaries, such as changes in taste, there will continue to be volatility and unpredictability in the grape supply market.

I can predict one thing with certainty. High performance vineyards will continue to be those where the manager's shadow is frequently present! ■

Dr. Richard Smart, "the flying-vine doctor," is an international viticultural consultant. Contact him in Australia by fax at 011-612-6584-0121, or by e-mail: vinedoctor@compuserve.com. Visit his home page at http://www.smartvit.com.au. He visits America frequently and can be contacted at Vinquiry in Windsor, CA, tel: 707/838-6312.

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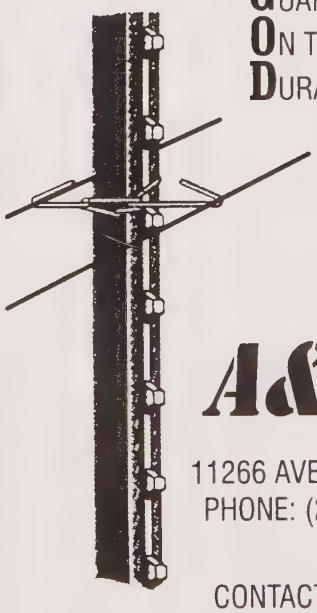

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Topics: Establishing a winery/vineyard, Phenolics and tannins in grapes/wines, Barrel maintenance, Barrel alternatives, New rootstocks, Assessing grape maturity, New wine grape cultivars, Disease control with new fungicides, Phomopsis, Weed control, Composting, Soil insects.

Inquiries to: Ohio Wine Producers Association, tel: 440/466-4417, 800/227-6972, fax: 440/466-4427.

VITICULTURE 2000

Feb. 18-19, Adams Mark Hotel, Buffalo, NY

Topics: Managing vine size, Managing wine grapes for quality, Current issues in juice grape production, Markets for New York grapes in 21st century, Physiological perspectives on root growth and function, Matching rootstock scion and soil, Care and maintenance of grafted vines, New developments in vineyard establishment, Niagara grape production.

Inquiries to: Lake Erie Cooperative Extension, tel: 716/672-2191, fax: 716/679-3122, e-mail: pat8@cornell.edu or visit web-site: http://lenewa.netsync.net/public/vit2000.htm.

GLOBAL WINE PACKAGE DESIGN/MARKETING CONFERENCE

March 23-24, Hotel Nikko, San Francisco, CA

Topics: The financial state of the wine industry and what lies ahead; How to marry marketing with package design for optimum brand identity effectiveness; Advantages and disadvantages of in-house design capabilities compared with using outside resources; How to make market research pay off; How to coordinate advertising, packaging, and other creative talent; How to navigate your label designs through BATF regulations; Changing role of the importer as a force in the industry; and How to capitalize on the retailer's experience as support for marketing. Case histories of successful wine packaging and branding programs from wineries representing different regions and sizes will be presented.

Inquiries to: Murray or Phyllis Lubliner, Murray J. Lubliner Associates, tel: 212/734-7841, fax: 212/734- 4964.

THIRD ANNUAL RHONE RANGER TASTING

March 25, Herbst Pavillion, Ft. Mason, San Francisco, CA.

Any winery in U.S. making wine from any of 21 grape varieties approved and allowed in the Côte du Rhône is eligible to join the Rhône Rangers, provided its Rhône-style wines contain 75% of Rhône-approved varieties. The eight principal Rhône grape varieties grown in the U.S. are Carignane, Cinsault, Grenache, Mourvedre, Syrah, Marsanne, Roussanne, and Viognier.

Inquries to: Rhône Rangers, tel: 707/939-8014; fax: 707/939-8564; web-site: www:rhonerangers.com, Fort Mason Box Office, tel: 415/441-3687.

NEW YORK WINE INDUSTRY WORKSHOP 2000

March 29-30, Ramada Inn Geneva Lakefront, Geneva, NY

Topics: Red wine options; cultivar selection, yeast strains, use of Lysozyme, micro-oxidation, color and flavor-enhancing enzymes, and heat treatments, comparison of Pinot Noir production in New York and Burgundy, including a tasting. Vinification and brewing technology gala dinner and wine auction on March 31 and opening of Cornell Vinification & Brewing Technology Laboratory.

Inquires to: Nancy Long, tel: 315/787-2288, fax: 315/787-2284, e-mail: npl1@cornell.edu, web-site: http://www.nysaes.cornell.edu/fst/faculty/henick/wiw/index.html.

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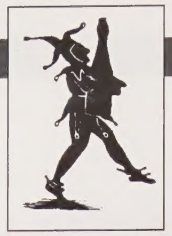

by Jake Lorenzo

Interrogation

There's an art to interrogation.

When Jake Lorenzo speaks of interrogation, I'm not talking about torture. I'm not talking about tying some poor soul to a chair and submitting him to all types of physical and psychological abuse. No, what I'm talking about is the intelligent use of conversation to extract information.

Cops are artists at interrogation. When they put you in the precinct sweatbox to ask you a few questions, they are on their own turf. They are masters of persuasion, of confusion, of timing. They can turn things around until you don't know up from down, right from wrong, Chablis from Burgundy. Spend a few hours with cops in a small room, and they'll have you confessing to crimes you never knew existed.

That's why I tell Jakelyn's mom, "If you ever get taken in by cops, get a lawyer. Never answer cop questions. They've got an agenda, and that agenda is not helping you out of a sticky situation."

You're probably thinking, "What does this have to do with wine? In fact, given Jake's propensity to wander when choosing his subject matter, what does this have to do with life?" You're probably thinking, "I'll never interrogate anybody, and I hope, I'll never be in a situation where I am being interrogated."

Well, Jake Lorenzo has news for you. This isn't like high school trigonometry, which has limited use outside the academic realm. Once you realize that interrogation is the intelligent use of conversation to extract information, you understand that interrogation is the interview. We have all been interviewed — whether for job opportunities, medical histories, or eyewitness reports.

Most of us are familiar with job interviews. If you are in the wine business, especially in a management position, you've probably spent plenty of time interviewing people. If you actually own a winery, then you know that hiring the right winemaker is crucial to the success of your business. Interrogation is an art form that you should learn. It can save you a lot of grief later on.

As Jake Lorenzo sees it, there are just two things required when interviewing someone for a winemaking job. First, you want to make sure the person has enthusiasm. No one can make decent wine if she isn't enthusiastic. He needs to have plenty of energy and drive if he is going to get through crush. Simple questions that elicit applicants' interests will usually let you know about their enthusiasm.

Second, there's the question, and the question is, "What's your favorite sport?"

If your candidate answers mountain biking, lose him. If she answers marathon running, tell her to set her running shoes on the exit road. If they answer football, punt them over to some other winery.

There's only one sport for true winemakers ... baseball.

Baseball is the perfect metaphor for winemaking. If a winemaker doesn't understand the nuances of baseball, then there's no way that winemaker can navigate the travails Mother Nature will place in front of him.

Think about it. Baseball starts with spring training, a rite of renewal where everyone has hope, confidence, and a chance for a great year. Spring training even coincides with bud break. At exactly the same time your favorite ballplayer is stretching his muscles and shaking out the vestiges of the off season, your grapevines are popping their buds and shaking off the chill of winter.

The regular season is a long drawn-out affair, but every day counts. One single game can make the difference at the end of the season, but the simple regularity of things; the "every dayness" of it can lull you into inattention.

It's the same in the vineyard. From bud break to harvest is six months. Nature seems to take care of itself, but before you know it mildew is cropping up, or mites, or some root louse.

A winemaker is to the crew what a manager is to his team. There are no recipes. There is no magic formula. Intuition, experience, and luck all play a part. A good manager can deflect media attention away from his team, and he can deflate pressure buildup among his players.

A good winemaker must do the same with his cellar rats. Both managers and winemakers need to get everyone working together for the common good. That's teamwork, and it leads to great results.

Baseball is all about continuous reappraisal of data, and then making spontaneous decisions based on that data. A hitter must adjust his thinking according to the count. Fielders must position themselves according to the pitches thrown to the batter.

In winemaking, especially during harvest, things change from minute to minute. A winemaker must be relaxed enough to assess these ever-changing situations, and attentive enough to make the right call.

The playoffs and the World Series occur during harvest. At the exact time that winemakers are under the gun, baseball plays out for us under its greatest tension. Winemakers think in terms of vintages: 1999 was late, but the weather held; 1997 was the huge crop; 1994 was the great year.

Baseball fans remember the turning points. They remember the ball rolling between Buckner's legs or the kid reaching for the fly ball and turning it into a home run.

Baseball, like winemaking, is pastoral, timeless, and ongoing. It consists of a myriad of details, most unknown and unseen by the public, all of which contribute to success. In both instances, as soon as you finish one great season, you've got to start over and try to make it happen again.

There's only one question, and that question is: "What's your favorite sport."

There's only one answer, and that answer is, "Baseball."

On the other hand, I guess you could answer, "Drinking wine at a baseball game." ■

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